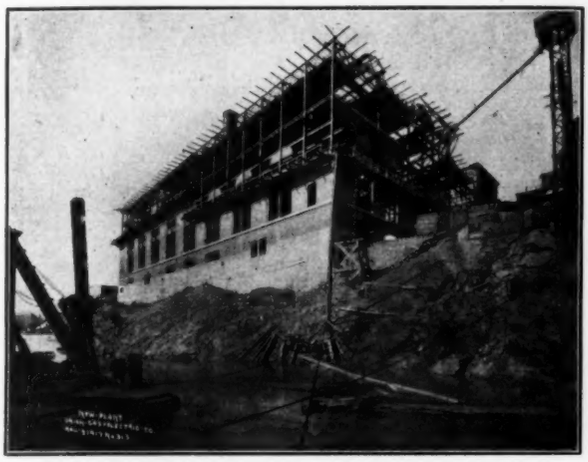
Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

VOL. 72—NO. 4. CHICAGO, SATURDAY, JANUARY 26, 1918. PAGE 141.



General View of Station From River Before Exterior Was Completed.

View in Turbine Room, Looking East, During Construction.

New Central Station of Union Gas & Electric Company at Cincinnati

Noteworthy Features of Construction of Large and Efficient Plant Which Is Nearing Completion

AT CINCINNATI there is nearing completion one of the most important central stations now under construction. On placing it in service, probably during next March or April, marked saving will be effected in the fuel used for generating electricity in that big city. This fine new station of the Union Gas & Electric Company embodies numerous very interesting features unique in power-house design. A preliminary description of the plant appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 2, 1916. The present article deals principally with certain construction features, a much more detailed description of the station being reserved until after the plant is placed in operation.

Erection of the new station became necessary principally because numerous conditions made further operation of the company's old station at Plum and Charles Streets uneconomical. This old plant has been remodeled and added to several times. Its present rated capacity is 38,000 kilowatts and the equipment is of varied character, comprising both modern and obsolete apparatus. The station uses natural gas as fuel in summer and coal in winter, but the absence of railroad tracks necessitates hauling all the coal by wagon or truck. Condensing water is drawn from an old canal in front of the station, but the water is not clean and the flow is insufficient for the condensing requirements; moreover, this canal is soon to be abandoned and used by the city as bed for a rapid-transit subway. To operate non-condensing is very poor practice and to build a cooling tower or pond is out of the question because of lack of room. In view of all these conditions, the building of a new and efficient generating station had to be undertaken. After the successive units in the new station are placed in service, it is planned to close down more and more of the old station and to remodel it as a substation, the most efficient generating units being retained for standby service until the new station has all its four units completed.

The new plant is situated on the north bank of the Ohio River, only about one-half mile northwest of the business center of the city and close to the tracks of several railroads. The station grounds comprise about 10½ acres between the river and Front Street and directly opposite this street is the new artificial-gas works of the company as well as the terminal substation of the high-pressure natural-gas mains from the West Virginia gas fields. This site is therefore ideally located for a large and efficient power station, combining abundant and economical supplies of condensing water and fuel. Coal can be delivered by rail or water and stored in considerable quantities on the station grounds. During the summer it is expected

to use as fuel for all or part of the boilers the surplus natural gas not needed for distribution in the city.

Foundations, Condenser Wells and Tunnels.

The site chosen consisted partly of the old gas works of the company and partly of an old rolling mill. Work on the new plant began in 1916, the old buildings being all first torn down. On account of the closeness to the river, the nature of the soil and the great depth at which the water tunnels and condensers are located, the work on the foundations and related substructure constituted an unusually large part of the plant construction. At the north side of the building the foundations extend down about 65 feet below ground level, nearer the river they are deeper, and for the intake and condenser wells they reach nearly 100 feet below ground. For the most part pneumatic caissons were used in sinking the foundations, which are of reinforced concrete.

There is a differenc of 70 feet between extreme low-water and high-water stages on the Ohio River at this point. To secure economy in pumping the circulating water for the condensers, the latter must be located near low-water level so that the pumps have a relatively low lift even at times of drought. On the other hand, at high water the station must be thoroughly protected from flooding, which has submerged the station site by as much as 8 feet. These considerations resulted in locating all the usual boiler and turbine-room equipment, except condensing apparatus, well above the highest known flood stage, which is 501 feet above sea level; the boiler-room basement is at elevation 504, while the main turbine and boiler-room floors are at elevation 522 feet. The condenser wells extend down 84 feet below the turbine-room floor.

The intake and discharge tunnels lie below low-water level and extend 163 feet from out in the river to the screen and intake basin or well. The intake tunnel is 10 feet wide by 25 feet high and the discharge tunnel is 10 by 10 feet and adjoins the larger tunnel. The river end of the tunnels was built after a large cofferdam had been sunk. All of the tunnel walls are of concrete. The intake tunnel leads to the screen basin in which there is a triple screen equipment to clear the condensing water of ice, branches, twigs and leaves of trees, as well as other floating trash carried down by floods which would quickly befoul the condenser tubes. First there is a set of stationary bar-iron grills, second a group of four motor-driven Link-Belt traveling screens, and finally a set of stationary screens. This intake and screen basin is 60 feet in diameter and 86 feet deep; its walls are of reinforced concrete 6 feet thick up to the turbine-room floor.

From this basin there is a 54-inch concrete duct to the suction of each condenser circulating pump. The condensers are set in pairs in large condenser pits or wells 68 feet in diameter and 84 feet deep, one in the east and one in the west end of the turbine room: these pits have reinforced-concrete walls 8 feet thick to the floor of the turbine room, the walls forming part of the foundations for the big turbo units. All of the work on the foundations, tunnels, basins and pits was done by the Foundation Company of America.

Features of the Superstructure.

The station building is a brick, steel and reinforced-concrete structure 333 feet long parallel to the river and 222 feet wide. It has a height of 100 feet from ground level to the coping. The steelwork forms the main supporting framework of the building and also serves to carry the two steel stacks which extend about 100 feet above the boiler-room roof. The American Bridge Company was contractor for the steelwork, erection of which began last April and was completed last fall.

All the exterior walls of the building are of red pressed brick, the outline forming a very pleasing architectural effect appropriate to the conspicuous location of the station high on the river bank. The brick exterior is backed with reinforced concrete, an interesting method of bonding the two being used. Each sixth course of brick consists of headers. The brick wall was carried up through the height of two headers. The form on the inside was brought to the same level, reinforcement inserted and the concrete then poured in place. This construction permitted the brick wall to act as the outer form for the concrete, thus saving considerable expense; an excellent bond was also thereby secured between brick and concrete.

As now constructed, the building is large enough to house four generating units, each of 25,000 kilowatts capacity. At present two of these are being installed. After all four units have been installed in the present building, it is planned to extend it eastward to provide for two additional units, making the ultimate capacity of the station at least 150,000 kilowatts. The turbine room is on the river side of the building and the boiler room on the Front Street side, the length of each, at present, being 300 feet, and the width 68 and 150 feet, respectively. A unique feature of the design is the location of the switch house over the turbine room, which gives the entire station a uniform height and reduces the ground area of the building. It also served to reduce the volume of the foundations compared to what would have been required by the usual position of the switch house alongside the turbine room—an important saving in this case on account of the costly nature of the foundations already made clear from the foregoing.

Coal and Ash Handling.

Coal will be received either by rail or water. Railroad cars will deliver the coal either direct into the boiler room or to a large outdoor storage yard between the building and Front Street, capable of storing about 35,000 tons. An electric gantry crane with 174-foot span and grab bucket is provided in this yard for unloading the cars to the storage pile or reclaiming from storage to automatic dump cars that carry the coal into the boiler room. Coal brought by river will be hoisted mechanically from the barges and delivered either to the storage yard or direct into the boiler room.

Below the middle of the boiler-room basement floor is a coal pit running the full length of the station. It has concrete sloping side walls and concrete cross or sectionalizing walls. Its capacity is 7500 tons and it serves both as a receiving and indoor storage pit. Over each side of the pit, just inside the edge, is carried a standard-gauge railroad track without the usual ties and supported by concrete-incased I-beams that span the cross walls of the pit. Trains of bottom-dump railroad cars or the company's own automatic dump cars are run over the pit on these tracks and the coal is quickly dumped into the pit. The sloping sides cause the coal to roll toward the center of the pit.

The central aisle of the boiler room has a series of large protected openings through the floor that give

access to the coal pit below. Spanning this aisle just below the roof is an electric traveling coal crane with a three-cubic-yard grab bucket, which, like the bucket for the yard gantry crane, was furnished by Orton & Steinbrenner, Chicago. This bucket picks up and weighs the coal and hoists it into any of the steel hoppers in front of the boilers. Each hopper will hold one day's supply of coal for the boiler it serves. This system of coal handling for the boiler room is very simple and economical. The coal crane and bucket is completely controlled by one operator, who can make one trip a minute with about two tons per trip. This system has been used heretofore in about one other plant—the Windsor (W. Va.) joint power station of the American Gas & Electric and the West Penn Power companies recently placed in operation.

Ash removal is also simple and direct. In the basement below each row of boilers is another standard-gauge track that runs the entire length of the station and lies directly below the ash pits of the boilers. By merely opening the ash-pit gates the ashes are dropped directly into railroad cars and hauled away to dumps or other places of disposal. All switching of cars in the yard will be done by the company's own electric locomotive.

Boiler-Room Equipment.

On either side of the central firing and coal-handling aisle of the boiler room is a row of boilers. Four boilers constitute the battery for a turbo unit; three of these suffice to supply its steam and the fourth is a reserve or emergency boiler. Each boiler is set independently with liberal space on all sides. At present eight boilers are being installed, four on each side the firing aisle.

The boilers are Babcock & Wilcox cross-drum water-tube boilers, each with 12,625 square feet of heating surface exclusive of the superheater. Each boiler is steel-incased with heat-insulating lining. It is designed for a working pressure of 250 pounds per square inch and 250 degrees Fahrenheit superheat and is rated for an evaporation of 100,000 pounds of water each hour.

Westinghouse underfeed stokers with 16 retorts are provided for each boiler. Each is driven by a variable-speed direct-current motor. Forced draft is furnished by motor-driven Buffalo blowers. Above each boiler is a Sturtevant economizer with 8760 square feet of heating surface. A motor-driven Sturtevant induced-draft fan and a by-pass around the economizer are also provided. For each four boilers there is a brick-lined steel stack.

The boiler-feed pumps will be of the centrifugal type and half of them motor-driven while the other half are steam-turbine-driven. With the exception of a turbine-driven exciter set, these are practically the only steam-driven auxiliaries in the station, it being felt that better all-around results are obtained by use of motor-driven auxiliaries.

Turbine-Room Equipment.

Each of the main generating units consists of a Curtis horizontal steam turbine direct-connected to a 25,000-kilowatt, 13,200-volt, 60-cycle, three-phase generator. These units are being supplied by the General Electric Company. The units extend longitudinally along opposite sides of the turbine room with the low-pressure ends of the turbines of two units bridging a condenser well. The exhaust from each turbine extends straight down some 70 feet as a huge pipe and enters its surface condenser at the side. The condensers are of H. R. Worthington vertical type and each has a total of 52,000 square feet cooling surface, with a rated capacity of condensing 330,000 pounds of steam an hour. Each condenser well or pit contains the two condensers of a pair of main units and a complete set of Worthington auxiliaries for each condenser, comprising circulating, vacuum and condensate pumps, all of centrifugal type and driven by individual induction motors. An electric elevator is

Installing the Economizers for Boilers 1, 2 and 4.

being put in for conveniently reaching any level of the condenser well.

Auxiliary to each main generator is a ventilating or cooling set equipped with the Spray Engineering Company's air washing and cooling apparatus. Each generator has its own direct-connected exciter rated at 210 kilowatts, 250 volts. There is a special storage battery for emergency excitation of any generator field in case of failure of the direct-connected exciters. A third source for excitation current is provided in a steam-turbine-driven set with two direct-connected generators, one of 200 kilowatts, 250 volts, for the exciter bus, and the other of 200 kilowatts, 600 volts for emergency supply to the 600-volt direct-current bus that supplies the direct-current station auxiliaries, such as stoker drives, crane motors and electric locomotive. Normally this set will be idle and the 600-volt direct-current supplied by two rotary converters of 750 kilowatts each connected on the alternating-current side through transformers to the station bus. These rotaries, as well as the special turbine set just referred to, will be on the turbine-room floor.

All of the induction motors for either unit or miscellaneous station auxiliaries are supplied with 600-volt, three-phase current by means of Westinghouse three-phase, 1800-kilovolt-ampere, 13,200/600-volt transformers. Each main generator normally supplies one of these transformers for furnishing energy to its own auxiliaries and there is also a spare unit for supplying the 600-volt, three-phase station bus to which miscellaneous station motors are connected.

Spanning the turbine room is a 110-ton four-motor traveling crane which has proved very useful in installing the heavy machinery. During construction it has been supplied from the company's lines. It will serve for lifting the heavy traveling and stationary intake screens for special cleaning or repairs (which was one of the reasons for locating the intake well in the turbine room) as well as for general handling of machinery during future plant extensions.

Operating Room and Switch House.

At the west end of the turbine room is the operating and office section of the station. The station operator's room, from which all major operations are remotely controlled, is located so as to overlook the entire turbine room. There are also offices for the chief engineer and load dispatcher, first-aid quarters, drafting room, sleeping room for certain operators and restaurant space.

All of the switching and switchboard equipment in the operating room and switch house, as well as several unit and station-auxiliary panels, are being furnished by the Westinghouse Electric & Manufacturing Company. The main operating board is of the benchboard type and controls the main generators and the exciters, also the primaries of the unit-auxiliary and station-auxiliary transformers. Outgoing feeders are controlled from a vertical board with 14 two-circuit panels. Another vertical board with 14 panels carries the watt-hour meters and other instruments for the feeders. Other special panels are provided for automatic voltage regulators, curve-drawing instruments, synchronizers, relays, etc.

On the operating floor of the turbine room are three auxiliary boards, each with five two-circuit panels for controlling the main circuits for the auxiliaries for the units and for general station service. Other special panels are also found in different parts of the station. In no case do any of the high-voltage circuits come near any of these panels nor those of the operating room.

The 13,200-volt generator circuits are carried up directly in special ducts to the switch-house floors over the turbine room where all the high-voltage switching is done in individual cells. The busbars and oil switches are isolated in brick and stone compartments. Triple-pole, single-throw, cell-mounting, solenoid-operated, oil circuit-breakers rated at 22,000 volts, 2000 amperes, are used for the main generator and bus-sectionalizing switches, and similar breakers of 22,000-volt, 600-ampere rating are used as

Switch-House Floor, Show Bus and Switch Structures Being Erected.

switches for the 300-ampere feeders. Power-limiting reactance coils are introduced in the main buses between the generator units to prevent dangerous short-circuit currents from involving more than one unit, and similar reactance coils in the feeders prevent troubles from spreading. An auxiliary bus is provided to permit inspection and repairs to the bus sections and oil switches without interrupting service.

Outgoing Feeders and Underground Conduit Construction.

All of the outgoing feeders will be supplied at generator voltage without transformation. They all leave the station in underground conduit lines of special construction near the plant and will supply the company's several substations on the radial-feeder plan. At the alternating-current substations the voltage will be stepped down by 2000-kilowatt single-phase transformers from 13,000 to 4500 volts and distributed over the four-wire, three-phase distribution system now in service. At the two direct-current substations the voltage will be stepped down to suitable value and the energy passed through 60-cycle, interpole booster converters feeding the Edison 275-volt, three-wire direct-current system. Several Westinghouse converters of this type and rated at 3500 kilowatts are now being installed, together with Westinghouse switchboards therefor. The alternating-current substations have switchboards of General Electric manufacture.

The feeder cables are lead-sheathed, paper-insulated, three-conductor cables with conductors of 400,000 circular-mil size. These are said to be the largest 13,200-volt cables ever made, having a diameter of 3.25 inches. The cables are drawn into 4.5-inch Orangeburg fiber duct for the most part. A total of about 674,000 duct-feet of underground construction will be installed, of which about three-fourths is fiber duct and one-fourth tile duct. The conduits are arranged two ducts wide and two to five high to give maximum strength and low installation cost. About three inches of concrete separates the ducts and surrounds the entire conduit.

Leaving the station there will be four conduit runs of ten ducts each. This district near the river is liable to be submerged at times of high flood, at which times the silt carried by the overflow would clog the manholes and ducts. To prevent this, the low portions of the conduits are made water-tight by using double covers for the manholes, the inner one having a gasket and tight fitting seat. The conduits pass under a large number of railroad tracks and, particularly along Plum Street, run uphill for many blocks. These difficulties, together with interferences from underground structures of other utilities, necessitated considerable special construction at manholes. These are in many cases of two-level type, the cables rising in the center of the manhole as much as 12.5 feet and leaving at the higher level. At various points in the conduits thermometers will be installed in pipes so that dangerous temperature rises due to very heavy loading of the cables can be readily detected. It is also proposed to use artificial cooling of the cables, if this is indicated as necessary by the thermometer readings. Near the station the conduits pass through cinder fill, so it is intended to turn water over the conduit run, this finding its way down and around the conduit. At points higher up it is possible to introduce city water into the conduits at several points, this flowing down along the ducts and manholes toward the station, where it will drain into the river, thus effectively cooling the cables all along.

These features are typical of the great forethought and detailed study given to every part of the design and construction of this large, new power station, which will represent a distinct achievement in central-station practice as regards reliability and economy of electric power production.

Effect of Fuel Order on Utilities

Result of Five-Day Shutdown Has Marked Effect in Some Localities and Has Resulted in Considerable Saving in Coal

WITH five-day industrial shutdown a thing of the past, utilities are now better able to view with calmness what has transpired and review their losses in revenue and accomplishments in the way of coal conserved. The situation is unique and its scope vast and far-reaching. Local conditions vary so widely that perspective is lost, the viewpoint easily becomes distorted and the true state of affairs hardly determinable. In fact, the situation cannot be considered as a whole, no more than could the order be 100 per cent efficient and equitable without modifying it for each locality according to the coal and congestion situations. Criticism there has naturally been by utility men, but it has been dignified and reasonable compared with the wild tirades vented by some who knew less of the real situation, and had less at stake. We are concerned with the consequences and not the causes, however, for the sudden mandate calling for cessation of industry throughout the East and Middle West. Nevertheless, the Middle West feels that it has been made to suffer for conditions in the East. It has sent cars and locomotives east and robbed itself; and these have only added to the congestion and paralysis of eastern terminals.

The blizzards and snow storms are blamed for the latest failure of the roads; the mild spell for making advantageous a cessation of industry. It appears, however, as if industry would in any case have had to shut down sooner or later for lack of coal and other supplies, hence the federal ruling not only saved panic, loss and suffering, such as might reasonably have been expected, but turned to advantage a fortunate opportunity. All are agreed that necessity made some sort of action compulsory. There is difference in opinion, however, as to whether the universal cessation order was the most effective method to employ, whether it was altogether wise, and whether the short notice served did not to large extent prevent the saving of fuel such as would have been possible by previous preparation.

Coal has been saved, there is not a doubt of that, since coal not burned today is coal available for tomorrow. But, the cost of saving coal by the utilities seems out of all proportion to the saving. Railroad congestion was, it is claimed, assuredly reduced, which is natural since some three and one-half working days became non-productive days, and thus terminals and tracks were reduced to some extent, making possible increased passage of coal.

Object of the Fuel-Saving Order.

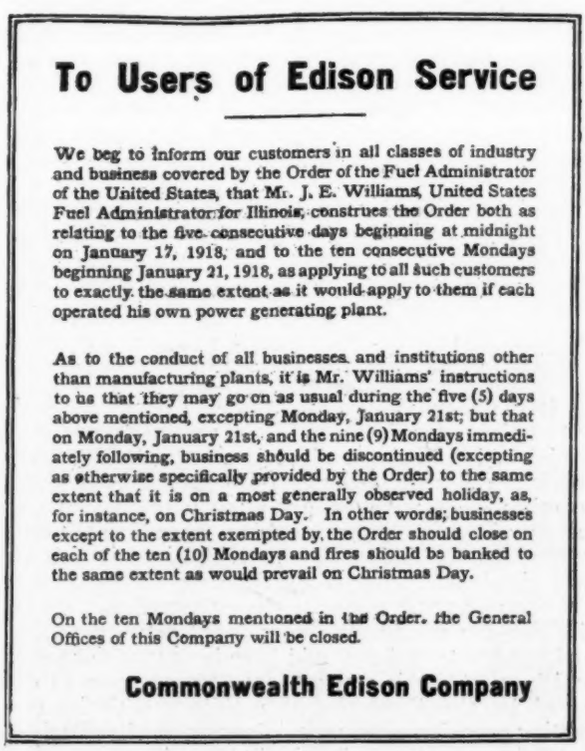
While the object of the fuel-saving order was undoubtedly to conserve coal and increase the available supply, the basic purpose was to interrupt the flow of freight to the snow-bound overloaded railroads, and in this way enable them to reduce their congested terminals and tracks occasioned largely by the blizzards. With existing conditions alleviated, fuel needed by the small domestic and industrial consumer as well as the large consumer, could be sent on its way. The immediate object of the law was to improve the fuel situation, a situation in turn dependent upon the railroads.

Expressed in measure of coal saving the shutdown appears to have accomplished comparatively little; in fact, a ridiculously small saving by the central-station companies. At the same time the saving was made at very large reduction of gross income. All plants are not alike, and a large decrease in output does not necessarily signify large saving of coal nor large decrease of output corresponding loss of revenue. The condition under which utilities operate are radically different to those obtaining for industrial plants, and while the former used less coal, and used it less efficiently, the latter undoubtedly reduced their consumption considerably.

Speaking of the effect of the shutdown upon coal saving, Samuel Insull, president of the Commonwealth Edison Company, and chairman of the Illinois State Council of Defense, says:

"From my experience as president of the Commonwealth Edison Company, I think that the national shutdown has very greatly relieved the fuel situation. The difference in output of the Edison company between Thursday last and Monday is between 35 and 40 per cent. There is every reason to believe that if it were possible to poll all of the establishments of the city using coal outside of domestic use it would be found a similar saving has been made in coal consumption.

"From my knowledge of things as chairman of the State Council of Defense, I believe that, although the acuteness of the situation hasn't passed, yet on the whole Chicago is in reasonably good condition for fuel.



To Users of Edison Service

We beg to inform our customers in all classes of industry and business covered by the Order of the Fuel Administrator of the United States, that Mr. J. E. Williams, United States Fuel Administrator for Illinois, construes the Order both as relating to the five consecutive days beginning at midnight on January 17, 1918, and to the ten consecutive Mondays beginning January 21, 1918, as applying to all such customers to exactly the same extent as it would apply to them if each operated his own power generating plant.

As to the conduct of all businesses and institutions other than manufacturing plants, it is Mr. Williams' instructions to us that they may go on as usual during the five (5) days above mentioned, excepting Monday, January 21st; but that on Monday, January 21st, and the nine (9) Mondays immediately following, business should be discontinued (excepting as otherwise specifically provided by the Order) to the same extent that it is on a most generally observed holiday, as, for instance, on Christmas Day. In other words; businesses except to the extent exempted by the Order should close on each of the ten (10) Mondays and fires should be banked to the same extent as would prevail on Christmas Day.

On the ten Mondays mentioned in the Order, the General Offices of this Company will be closed.

Commonwealth Edison Company

Notice Published in Chicago Newspapers Explaining the Fuel-Saving Order, as the Commonwealth Edison Understood It.

"The railroad companies are putting more coal on their sidetracks than they normally do at this time of year, and it is promptly distributed.

"I believe that if the public will have a little patience it will have good reason to thank Mr. Williams and the staff of the Federal Fuel Administration for carrying us through a great emergency. If we have no severe storms during the next week or two empty cars will be promptly returned to the mines and loaded and brought back to Chicago and the crisis will have been passed."

Effect of Shutdown Upon Utilities.

An examination of a large number of reports from central stations shows wide variation in coal saving, also in reduction of output. Many factors enter, such as coal per kilowatt-hour, size of units and their efficiency, amount of coal used for banked fires; number of units kept available in readiness to serve; forms and relative proportion of different forms of load, and so forth.

In Detroit, with its 579,635 population, the reduction of daily output is estimated at about 500,000 kilowatt-hours, or 23 per cent, and the daily saving of coal in the neighborhood of 500 tons.

In an eastern city of 700,000 people the output dropped 800,000 kilowatt-hours per day, saving thereby 800 tons of coal, but at a loss of revenue of $10,000 daily. In another eastern city with a population of 450,000, the five-day loss in production amounted to 1,047,000 kilowatt-hours, at a loss of revenue of $21,000, but with a saving of 1500 tons of coal. One company estimates that for every ton of coal saved it lost $14, not including overhead charges.

Central stations are diffident to express the cost of the shutdown to them on account of reduced gross revenue. Some feel estimates would vary too widely to be of use; others do not care to tell. There is a universal feeling, however, that the shutdown came as a national service, and do not care to discuss income under such circumstances. In other words, the order was drastic, because conditions were desperate with others than themselves. And the country is at war.

Effect of Utility Shutdown Upon Total Coal Saving.

It is difficult if not impossible to determine what extent the reduced output of the central-station companies added to the total coal conserved. However, the following results apply to Chicago, and may apply to other cities with the exception perhaps that Chicago's utility supplies, if anything, more than the ordinary amount of industrial power. The daily coal consumption in Chicago during this season varies between 112,000 and 125,000 tons. It is estimated that the entire five-day period altogether saved between 200,000 and 225,000 tons that would have been used for power and heat. Of this amount, 3200 tons represents that saved by the Commonwealth Edison with its generating capacity of 400,000 kilowatts used exclusively for light, power and electrically made heat.

Chicago is credited with a population of about 2,400,000, but even so the saving of coal seems enormous. Equally, the saving obtained by the Commonwealth Edison Company appears almost ridiculous, but to obtain even this reduction, the utility had to forego between 35 and 40 per cent of its output for the five-day period. It is not known what proportion of the total energy in Chicago is furnished by the Commonwealth Edison Company. It is known, however, that half of the utility's output is generated by units of 20,000 kilowatts and higher, many of these units operating at 70 per cent load-factor having a coal consumption of 1.95 pounds of coal per kilowatt-hour; and that the overall coal consumption for the system is in the neighborhood of 2.75. In contrast to this must be considered the hordes of industrial plants, operating 8 and possibly 12 hours a day at a coal rate of anywhere from two to four times that of the utility.

The Spirit of the Central-Station Industry.

Notwithstanding financial loss incident to the shutdown, though sufficient coal or more than six weeks' operation was available in some instances, the utilities have taken the measure in laudable spirit, feeling they were public utilities first and private corporations second. Perhaps the general spirit of the central-station industry cannot be better stated than in the words of a small middle west central station which had ample coal and so situated that tracks were comparatively free from congestion. This company did its bit, for it saved 500 tons of coal in five days and lost $10,000 of revenue by so doing. It says, "We believe that the administration has definite plans as to what might be accomplished when the order was issued, a matter on which the public in general had little or no information and was likely to take snap judgment. If the carrying out of the order relieves the freight situation and removes the embargoes existing for some time, much good will, no doubt, be accomplished. We firmly believe that the nation should back up the administration more now than ever before, and as far as this company is concerned, we intend to do our bit in carrying out any orders that the Government may see fit to issue."

There is no doubt the fuel-saving order was drastic. But conditions in the East were desperate, and East and Middle West are one in war time. The utilities have suffered heavily by the fuel-saving order, as also with high costs of fuel, material, labor, taxes, and so forth. But the spirit of the industry is unshaken. "Stand by the President" is the keynote of opinions and creeds of the many utilities asked for their opinions and accomplishments of the fuel-saving regulation.

Electrical Engineering Societies Hold Joint Meeting.—Pittsburgh sections of the Association of Iron and Steel Electrical Engineers and American Institute of Electrical Engineers met in joint session at Hotel Chatam, Pittsburgh, Pa., on the evening of January 19, 1918. Dinner, served at 6:30 p. m., was followed by papers, discussion, entertainment and music. B. W. Gibson and B. A. Cornwell of the Ohio works of Carnegie Steel Company, Youngstown, presented for the A. I. & S. E. E. a paper on the Generation, Distribution and Consumption of Power; and Methods of Power-Factor Correction were discussed by R. A. McCarty, power engineer of Westinghouse Electric & Manufacturing Company, on behalf of the A. I. E. E. The Philadelphia Section of the Association of Iron and Steel Electrical Engineers will meet in Philadelphia February 2; the paper for that occasion will be presented by H. G. Steele, of Pittsburgh Transformer Company, who will discuss Mill Type Transformers. The Cleveland Section of A. I. & S. E. E. will meet in that city January 26, subject to be announced. Pittsburgh meeting of the organization will be held February 16, at Chatham Hotel, that city; at this meeting the subject of A. C. and D. C. Skips will be discussed in a paper by Mr. Lindquist of the Otis Elevator Company.

A Typical Motor-Driven Ice Plant

Peoples Fuel & Supply Company's Ice Plant Is Typical of Electrically Driven Plant with Central-Station Supply

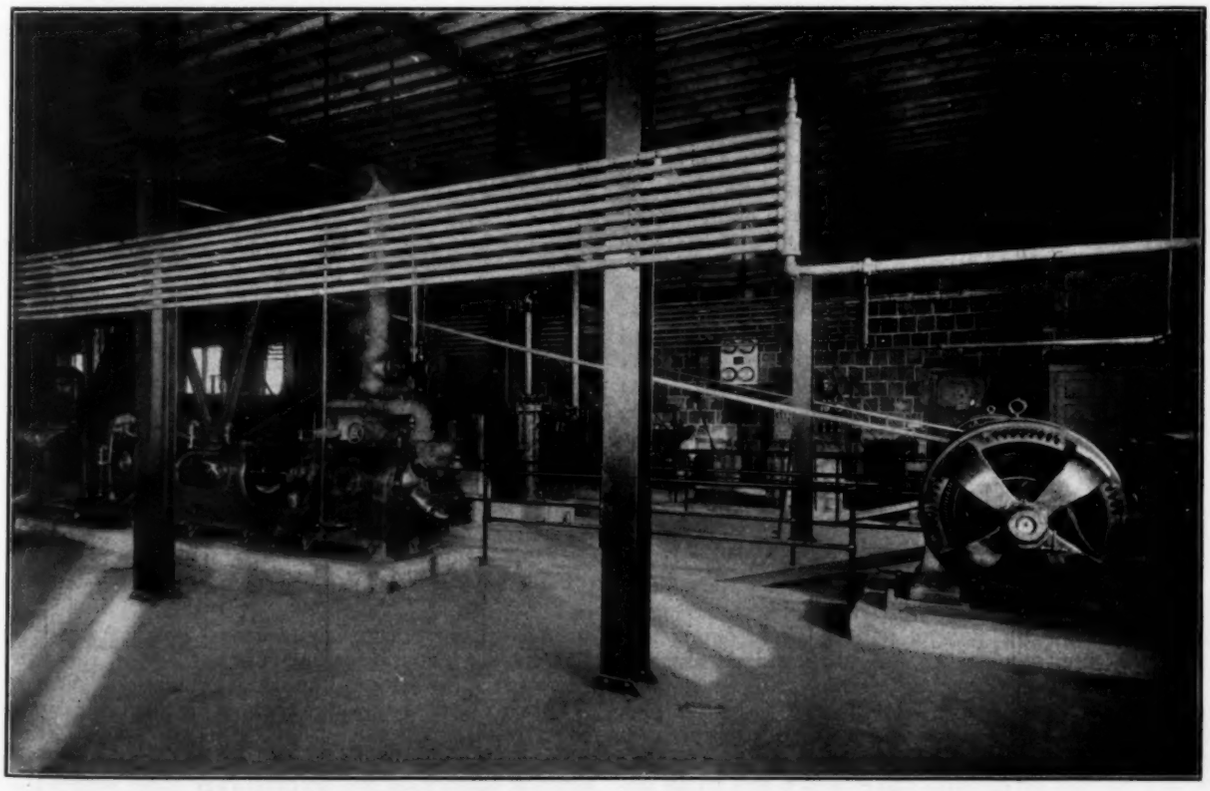
THE electrically operated ice plant of the Peoples Fuel & Supply Company, Chicago, is typical of the class of electrically operated raw-water ice plant which is springing up all over the country, but perhaps especially round Chicago where the local utility has done so much to encourage and develop the form of load constituted by refrigerating and ice-making plants. The Peoples Fuel & Supply Company, as its name implies, does a general business in supplies and materials, but more especially in coal, wood and ice. Until last summer the ice business consisted entirely of marketing natural ice, but the handling of natural ice has been almost abandoned since a plant for making artificial ice came into being.

The ice plant is essentially modern, it was only constructed last summer. It is compact and such that lost motion and heat losses are reduced to a minimum. It has been laid out to accomplish a definite purpose based upon a thorough knowledge of the seasons, the demand and possibilities of increasing the market. The proximity of the ice and coal plants tends to reduce labor costs and makes deliveries economical, since most of the force handles both coal and ice. The ice peak is one that comes chiefly between the late spring and late autumn, whereas the demand for coal is steadier the year round with its peak occurring during the cold months. The two peaks coming thus at different times of the year make the combination ice and coal business very economical as to labor, wagons, laborers, stables, etc. Both coal and ice plants are situated beside the tracks of the Grand Trunk Railroad, the location having been chosen with regard to coal delivery and the previous business of natural ice. However, the location is at the center of gravity, as it were, of the market for ice, a fact permitting of efficient and economical delivery, and to obtain which the electrically operated ice plant is so often advocated in place of the coal-burning plant with its noise, coal and ash traffic and smoke.

Transformer Vault, Metering and Control Apparatus.

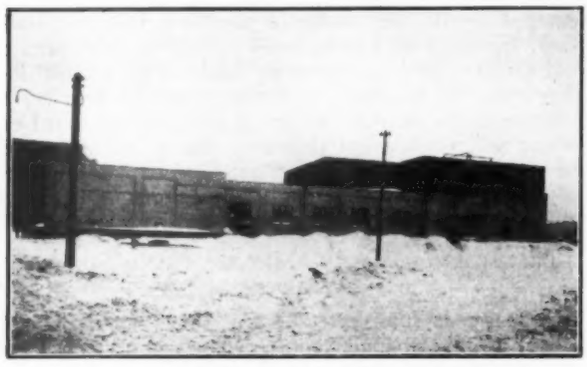
Energy is purchased from the Commonwealth Edison Company under contract for what is known as off-peak, transformed energy under the ice schedule. Energy is delivered to the utility's transformer vault over underground paper-insulated cables at 12,000 volts three-phase. The transformer vault is the property of the utility, is a fireproof structure of concrete and brick, equipped with iron doors and ventilators. Access to this can be had only through the employees of the utility. Trouble in the vault or cessation of power is reported to the Commonwealth Edison Company's load dispatcher who sends a man to investigate.

The incoming 12,000 volts is stepped down to 220 volts by three 150-kilowatt Pittsburgh oil-immersed transformers of the core type. These transformers are protected by 12,000-volt oil switches, controlled by a manually operated handle in the compressor room and also by automatic overload relays. A bell-ringing



View Showing Switchboard, Compressors, By-Pass Valve and Induction Motor.

alarm is installed by which the ice-plant operator is informed of trouble in the vault in the form of interrupted energy. Trouble in the ice plant is taken care of by fuses in the individual motor circuits, as experience has shown elsewhere that it is advisable to restrict the cessation of power supply to as limited sphere as possible. In this way trouble to one compressor is not



Exterior of Ice Plant, Showing Cooling Tower.

communicated to the other, and the plant is able to continue operating at fifty per cent normal.

Energy is purchased transformed, hence is metered on the 220-volt side of the transformers. Immediately outside the transformer vault, and on the floor of the engine or compressor room are the switchboards. One of these is the main switchboard and is the property of and was installed by the Commonwealth Edison Company. Upon this board are mounted the main 220-volt three-phase knife switch, the overload 12,000-volt relay, the integrating or recording watt-hour meter, printometer for recording half-hourly energy consumption, and a bell-ringing alarm to indicate cessation of voltage in the transformer vault.

To the left of the main control board is another board made by Henry Newgard, Chicago, known as the auxiliaries board. Upon this board are the switches and fuses for protecting all the auxiliaries of the ice plant, as well as the plant and office lights. All energy is metered, however, through one polyphase meter, under which circumstance free lamp renewals are not given by the utility. The auxiliaries board carries control for two pumps, two blowers and agitators, all three-phase, and various lighting circuits, with fuses mounted on rear and front.

The cycle of performance is a continuous one in what should be a closed system. The ammonia is compressed in the compressor to a gas, thence is passed under pressure to a condenser where the gas, due to its pressure and the cooling medium, changes from gas to liquid, whence it passes to a reservoir or receiver. From the receiver it is then fed to the expanding coils where it changes from liquid to gas, and in so doing absorbs heat. It then passes back to the compressor for use again in the same cycle.

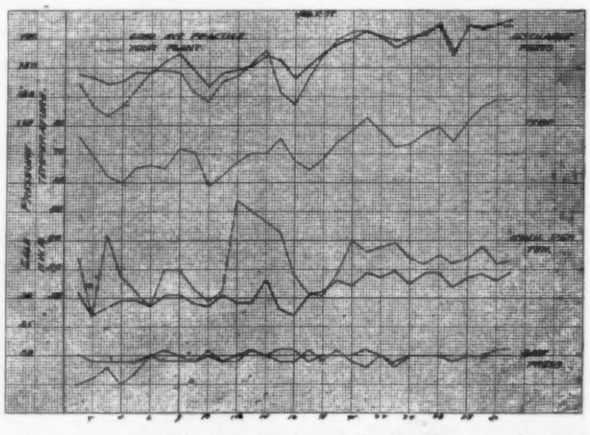
Main Engine or Compressor Room.

The main or compressor room contains the motor-driven compressors, the auxiliaries and water-treating apparatus; also the control panels for incoming and auxiliary supply, metering and starting apparatus.

There are two electrically driven Triumph double-acting compressors of 15-inch bore and 30-inch stroke, with capacity of 50 tons of ice or 100 tons of refrigeration each per 24 hours. Each compressor is equipped with a by-pass or division valve, which acts as an unloader for starting purposes by allowing the ammonia to pass back and forth between chambers of the compressor during starting, and in this way reducing time, current and power required for starting. The arrangement of the by-pass of unit No. 1 can be seen in the foreground of Fig. 1. Each compressor is belted to a paper pulley on a 150-horsepower three-phase induction motor by a two-ply 24-inch leather belt furnished by the Chicago Belting Company. The two motors driving the two compressors are standard Triumph 220-volt induction motors of the wound-rotor or variable-resistance-secondary type, operating at 495 revolutions per minute at full load. A motor panel is mounted close to each of these motors, upon which is mounted the main three-pole knife switch and alongside of which is the starting apparatus. This latter consists of Cutler-Hammer three-phase 220-volt starter, comprising six starting points of secondary resistance, circuit-breakers with low-voltage and overload release. Each motor is mounted upon a rack to permit easy and quick variation of distance between pulley centers, as a spare pulley of smaller diameter than that usually employed is kept on hand to permit changing the pulley ratios when seasonal changes make it desirable to operate one unit below normal full-load rating. By doing this higher over-all economy is obtained at light loads by improved load-factor and continuous operation, adding immensely to the flexibility of the plant as well as its over-all efficiency.

In the compressor room most of the auxiliaries will be found. All are started by autotransformer or autostarter except the one-horsepower coring motor used for operating the coring pump for removing the dirt and sediment from the center of the ice cake which is started directly from line.

The auxiliaries consist of one 10-horsepower Triumph three-phase squirrel-cage motor direct-connected to a centrifugal pump supplied by the Advance Pump & Compressor Company, of Battle Creek, used for pumping the cooling water through the cooling sprays. This pump operates at 1140 revolutions per minute and has a capacity of 500 gallons per minute, against a 35-foot head to the sprays on the roof above. The cooling sprays consists of 13 nozzles, and were fur-



Curve Showing Plant Performance During Summer Month

nished by the Spray Engineering Company. A 7½-horsepower induction motor is used to throw the water from the spray pans to the condenser.

Two Connersville blowers are installed for agitating the air in the air system, one as a spare. These blowers are belt-driven by 15-horsepower Triumph induction motors of the squirrel-cage type with pulley ratios of 10 to 24. The full-load speed of these mo-

tors is 1150 revolutions per minute whilst the blowers give 2.1 cubic feet of air per revolution.

The propellers for circulating the brine, of which there are two, are of 10-horsepower each. The pump for removing the core water from the ice during the process of making is driven by a belted one-horsepower squirrel-cage induction motor.

Tank and Storage Room.

The tank room contains two tanks, one for each 50-ton ice-making machine. Each tank holds 660 cans, and as each can is the equivalent of 400 pounds of ice, the total tank-room capacity is 1320 cakes of ice or about 264 tons of ice. The purity of ice is largely dependent upon the slowness with which it is made. The time varies between 46 and 52 hours per can, according to climatic conditions, which is about equivalent to 100 tons of ice per diem.

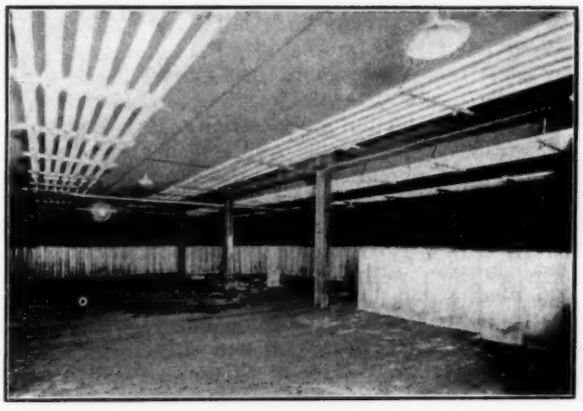
The tank room contains two traveling cranes, one for each tank, for carrying the cans from their position in the brine tank to the warming pond or dip where the ice is removed and sent to the store room. These traveling cranes were furnished by the Triumph company and are each equipped with two-horsepower three-phase induction motor of the squirrel-cage type. Each crane carries a Sprague ½-ton motor-driven hoist for picking up and lowering the cans which the traveling cranes transport. These hoists are each equipped with a 1½-horsepower Sprague motor.

The Peoples Fuel & Supply Company's plant has what might be called three storage rooms. The first of these is situated directly out of the tank room. It is a storage room but also an intermediate room through which all ice must pass from the tank room or storage rooms to the platform for delivery to the ice wagons. This room measures 43 by 80 feet and is 12 feet in height. All ice going to the delivery platform must pass through this room. Adjoining this storage room, which is really an intermediate room, and connected to it by a single outlet sufficient to allow a cake of ice to pass, is a second storage room or rather two rooms, the one leading to the other. These two

View Showing General Layout of Tank Room Looking Toward Storage Room.

rooms are the storage rooms proper and are each 34 by 23 feet and 26 feet in height. The outlet from the intermediate storage room terminates in a hoist operated by a three-horsepower G. E. squirrel-cage induction motor. This hoist is used to take the ice to or from the higher tiers when the storage rooms are being filled or emptied. Ice in the two larger rooms may be packed to a height of some 20 feet. The ice in the intermediate room is never stacked, as this room is used for temporary storage only and for short periods.

In any compression plant employing ammonia there is always likelihood of a leak or break occurring in the ammonia circuit. Ammonia fumes are of quick action in endangering human life, and should a break occur in the piping there is usually little time to make a get-away, and it is usually impossible to reach the con-



Interior of Intermediate Storage Room.

trol apparatus to shut the plant down. However, a complete shutdown is not always necessary. In the present instance a safety feature at once inexpensive and effective is employed. Instead of controlling the electrical supply, that is the motor-driven units, the ammonia supply is controlled. Strings to which handles are fastened are installed in various places inside and within reach of the outside of the building by which the supply or circulation of ammonia may be shut off without entering the building, and without shutting down the compressors by operating the safety check valve.

Operation.

The ice plant of the Peoples Fuel & Supply Company is typical of the electrically operated ice plant situated in the midst of its market. The plant was started up about the middle of last summer, but is now closed down under Federal ruling as to conservation of fuel. Normally, however, the concern makes ice for a number of local butchers, saloons and merchants, many under contract for the entire year, whilst caring for the seasonal demands of the domestic consumers that are small individually but assume large proportions in the aggregate during the hot summer spells. Notwithstanding the fact that the plant only started operation last summer it will be seen from the accompanying data that performance has already been

Month.	Kilowatt-hours Consumption.	Tons of Ice Made.
May	23,800	.....
June	79,600	1,472.4
July	150,800	2,396.0
August	173,000	3,382.0
September	112,000	2,372.0
October	49,000	1,034.0
November	11,400	292.0
December	9,800	170.0

gotten down to an economical basis. The value of such a load to the utility is also apparent, especially since the heaviest load is at a time when the peak load period of the winter is absent. During normal operation the plant requires the services of one engineer and two laborers per shift of eight hours and harvests 100 tons of ice per twenty-four hours. The plant was designed and installed by the Triumph Ice Machine Company, Cincinnati, Ohio.

Some Commercial Aspects of Hydroelectric Development

Statement of Present Conditions—A Comparison of Steam-Electric and Hydroelectric Plants—Laws Necessary to Encourage Development

By CALVERT TOWNLEY

THE introduction of electricity as a means for transmitting power over considerable distances and its subsequent rapid development completely has changed the status of hydraulic power. Previously such power could only be used near falling water. Now it is commercially available in convenient form within a radius, in some instances, up to 200 miles, a fact that has made it possible to utilize water powers even when located in remote and inaccessible places. Indeed, today practically all hydraulic power developments of any magnitude are hydroelectric. Along with improvements in the art of electrical transmission have come equally rapid developments in the application of electricity. Electric light has become almost the universal illuminant. Electric motors largely drive our factories and propel all our street cars. They have made substantial progress in replacing steam locomotives on some large railroads, while the manufacture of nitrogenous products for explosives and fertilizers, and of such products as abrasives and aluminum, depends for its commercial success on electrochemistry. In an endeavor to supply the demand for electric current thus created, large central generating stations have been established in or near all large centers of population.

Status of Development.

In the light of the foregoing, it might seem reasonable to suppose that a large proportion of the modern demand for electric current would be supplied from the energy in falling water. Such however, is not the case. Accurate statistics are difficult to obtain, but some approximate totals may prove illuminating. It has been estimated by a careful engineer that in 1911 there were over 26,000,000 horsepower in steam-engine capacity in use (including railroad locomotives), in the United States. The aggregate water horsepower developed and undeveloped has been computed as around 60,000,000. Of this latter the U. S. Census of 1912 gives 4,870,000 as developed, and in a report of January 1916, the Secretary of Agriculture estimates this total to have been increased to 6,500,000. Making liberal allowances for correction in these several figures, it seems probable that there are in service from four to five times as many steam as water horsepower and that there are still undeveloped water horsepower equal to at least twice that of all the steam capacity in service. Some of the undeveloped power sites are too remote from any market to be now utilized, and an uncertain number are not commercial prospects; but even so it is clear that the possibilities of additional development are very great.

Comparisons of Steam and Hydroelectric Plants.

There are two fundamental causes which have militated against the substitution of hydroelectric for steam-electric power. One is economic and permanent; the other is statutory and therefore subject to modification. Both reasons apply to some powers, but neither, fortunately, to all. The economic and permanent reason is high cost of development due to natural conditions. Electric power generated by falling water is inferior to that generated by steam in every particular except cost and, therefore, water-driven service must be cheaper than steam driven in order to justify its existence. The price for service depends primarily on cost, and cost divides itself naturally into two main items, namely, operation (including maintenance) and fixed charges. As a hydroelectric plant consumes no fuel, its operating cost is less than that of an equivalent steam-driven plant. On the other hand, a steam plant costs usually only from one-fifth to one-half as much per unit of capacity as a hydroelectric plant, so that the latter must carry very much heavier fixed charges. This disability of water service is usually even greater than the ratio of the costs of two equivalent complete developments. A power enterprise seldom comes into being with a market for its entire ultimate output. Therefore, when steam is to be the motive power, only such capacity is installed as initial demands require and the cost per unit is fairly proportional to that of the ultimate development. In a water development, on the contrary, a large part of the cost is for riparian rights, for the dam, impounding reservoir, flume, forebay, etc., and for the transmission right-of-way, lines, etc., which must be at the start, largely provided and constructed for the complete installation. The obvious result is a greater fixed charge per unit of capacity and a higher cost per horsepower delivered for sale.

In forecasting the commercial prospects of a power enterprise, the possible market must be studied and, of course, a sale price for power decided upon. As this price is controlled by the cost of similar service from other sources, usually from steam, and as it must be attractive from the start, the additional burden of fixed charges on the initial part of a hydroelectric installation frequently forces the sale of its power below cost. The projectors of the enterprise then must rely for success on a sufficient subsequent increase in their markets. The possibility of an incorrect forecast of the extent of such increase and of the time when it may come imposes a serious business hazard against water and in favor of steam.

Efficiency of Steam Plants Has Improved.

It has been frequently pointed out that as the nation's coal supply is depleted, the cost of coal must rise, thus increasing the cost of steam-electric power as a competitor and raising the market value of hydroelectric power accordingly. The rising price of coal is a matter of record, but it is not so generally known that the improved efficiency of steam-producing machinery (boilers, engines, generators and auxiliaries) has more than kept pace, so that the net cost of producing electric power from coal has steadily declined.

As applied to the pre-war period, it may be stated that over a period of ten years the cost of coal has risen on an average 1 per cent per year, while the cost of electric power produced from coal has fallen on an average 2½ per cent per year. In addition to these facts—still referring to pre-war conditions—the cost of steam-electric generating equipment has been greatly reduced. This fact is due partly to the introduction and subsequent improvement of the steam turbine, and in part to the great increase in the size of the units now available. There is nothing to indicate that the limit of improvement in the design of steam prime movers has been reached or is even in sight. It is, therefore, a reasonable assumption that further advances in the art will continue to occur and to cut down both the fixed charges and the operating cost of steam power as a competitor of water. The largest modern steam turbine has now some twelve times the capacity which the largest reciprocating engine had 15 years ago. Stated another way, the cost of a steam-electric plant per unit of capacity just before the war was about one-third what it was 15 years previous, while the energy it produces per pound of coal has increased 50 per cent.

In addition to the development of steam prime movers, the Diesel or the internal-combustion engine is now coming largely into use as a further competitor of water power where fuel oil is available, as in the southwestern district of the United States. The efficiency of these engines is considerably higher than that of the small size steam turbine and reciprocating engine. There has not been a like improvement in the efficiency nor a comparable reduction in cost of the small reciprocating steam unit and a natural result has been expansion of the central stations.

Water Power Not Always Cheaper.

As bearing on the water-power situation, obviously many sites which 15 years ago might have been developed to sell energy in successful competition with steam at its then cost could not now be so developed, and in consequence their development is no longer commercially possible. The cost of producing power from either water or steam is a function of load. Fixed charges remain practically unchanged in both instances where the output in energy be large or small, but with a steam plant increased output means increased fuel consumption, while a water plant operates either with or without load with but little variation in expense.

To illustrate by a concrete example representing not unusual conditions, suppose we assume a steam plant using two pounds of coal per kilowatt-hour at a price of $3 per short ton and having a plant or output factor of 35 per cent—that is to say, an output equal to 35 per cent of its theoretical output if every unit were loaded to capacity 24 hours each day of the year. Under these assumptions the cost of fuel per unit of installed capacity per year would be $11.50 and if the other operating and maintenance charges be assumed to fairly offset those of a water installation of equivalent size, $11.50 represents the additional fixed charges which the hydroelectric plant could carry and produce power at an equal cost. If the fixed charges (interest, taxes, insurance and amortization) total 11½ per cent, therefore, the hydroelectric investment per kilowatt of capacity could exceed that of steam by $100. This is not an abnormal excess. Many hydroelectric developments exceed the cost of equivalent steam-driven systems by much greater amounts in which cases they become commercial prospects only if either coal be more expensive per unit of output, or the plant-factor be higher, or some other operating or maintenance condition be more favorable. Further, as has been previously stated, hydroelectric power is inferior to steam-electric power. The reasons are elementary. Stream flow is subject to seasonal variation, and therefore to complete or partial interruption by drought in summer and by ice in winter. Floods are a menace. Long transmission lines may break from wind or sleet or the service be disarranged by lightning. The losses on such lines vary with load and are frequently responsible for annoying pressure variations. On account of these and other reasons, hydroelectric power cannot prevail against steam competition at the same or a slightly lower price. It must be materially lower.

Careful Investigations Necessary.

We do not mean to imply that water power may not be a commercially practicable competitor of steam. Many successful hydroelectric installations give substantial proof to the contrary. We do wish most emphatically to combat, however, the widely held but mistaken view that any water-driven plant will produce power at lower cost than steam can and that the margin is so large investors generally are eagerly seeking a chance to put money into hydroelectric projects.

The most careful investigation, frequently demanding substantial expenditure and the keenest scrutiny by experts, is needed to discriminate between worthy and commercially impractical projects, and the difference is often so small that the imposition of even what seem to be minor burdens is sufficient to turn the scale in favor of steam and entirely prevent what might otherwise be a desirable hydroelectric development.

Inadequate Laws Retard Development.

The second condition which vitally affects development is statutory. After 10 years or more of discussion it has come to be generally agreed that our Federal laws discourage the development of a large proportion of the nation's water powers and remedial legislation has been considered at every session of Congress for many years. The legal obstacles are quite distinct and separate from the economic facts described and are in addition thereto.

Of the estimated 65,000,000 undeveloped water horsepower in the entire country, approximately 40,000,000 is located within the boundaries of the 13 so-called western water-power states. In these same states the Federal Government still retains as proprietor 760,000,000 acres, or over two-thirds of the aggregate acreage of all these states taken together. In order to develop power in that section it is therefore nearly always necessary to use some part of this public domain, if not for the dam site itself, at least for flowage, for transmission right-of-way or for some other purpose. Existing law forbids such use except under permit issued by the Secretary of the Interior and revocable without cause, at any time, by himself or his successor in office. It was once believed that revocation would only follow gross abuse well established by evidence, but the drastic action of a one-time secretary of the interior some years since to the contrary, disabused investors of this confidence and demonstrated by a sad object lesson the insecure tenure afforded by existing law.

As funds for hydroelectric development must come from private sources, the unstable tenure imposed by this condition has constituted so great a hazard of loss that the private investor has been loath to assume it. The unfortunate—almost disastrous—result has been

practical stagnation in water-power development for many years.

Provisions Needed in New Law.

Many available power sites not in the western states, or not on the public domain, are on navigable streams. For each such project a special act of Congress is necessary. The difficulty of obtaining suitable rights by this means has been found so very great as largely to discourage, even if not entirely to prevent the developments affected. The several remedial laws recently considered by Congress recognize the essential facts and agree that the remedy is a new law containing the following provisions, namely: An indeterminate permit irrevocable during 50 years except for cause judicially determined, and continuing thereafter unless and until the Federal Government either renews its permit on mutually agreeable terms or for itself or through a new permittee takes over at its fair value the hydraulic works and certain other parts of the development. The various proposed laws differ as to what parts of the development may be taken; as to whether or not rentals shall be paid and their basis, and in many other particulars.

A hydroelectric enterprise being once successfully established, it is alike to the interest of the owners, of the Government and of the public that it should continue indefinitely without interruption. There is no economic reason to be served by a cessation and the only reasons for providing a legal means of recapturing the installations and the water rights are, first, to preserve an additional measure of government control against possible abuse by the permittee, and, second, against a remote contingency which might make it desirable that the Government would want to use the power for some other purpose.

Long-Term Permits Necessary.

A successful power enterprise at the end of 50 years will have multiplied the capacity of its initial installation many times, variously estimated at from five to twenty. In doing so, it is almost certain that not only will the entire power available at the original site be fully developed, but other powers as well, which latter may or may not be dependent upon government permits. Still further, in nearly all cases steam plants as well as water plants are necessary. These steam plants are necessary to supplement hydroelectric power at periods of low water and in case of interruption, as well as in some instances, to provide increased capacity. In fact, modern practice is rapidly approaching that of providing steam capacity equal to 100 per cent of hydroelectric for the purposes stated. In any event, the growth of the enterprise over a term of years will be continuous and progressive. There will never come a time when it may be said to have been completed and subject to no further expansion. This continuing growth makes burdensome and usually abortive any attempt to amortize the investment, while the investment in other water power or in steam plants, or both, interconnected with and generally dependent for their economic operation on the original development, renders the right to recapture that development only very onerous and one which constitutes a serious impediment to the free and full development of an enterprise which is otherwise most desirable from all standpoints.

With respect to power sites on the public domain and on navigable streams, the Government is in the position of seeking to have its resources developed without assuming any business hazard and without contributing either capital or credit. It would be unfortunate, in the light of past experience, if any new laws which may be enacted should put the Government in the position of bargaining with capital and of offering just sufficient incentive not to induce capital to undertake the developments desired, thereby, while apparently providing a remedy, in reality insuring a continuance of the present undesirable condition.

Hydroelectric enterprises must compete with the demands of other industries for capital. Experience has shown that even without the imposition of additional financial burdens many of them are not sufficiently attractive to secure development and as the attractive prospects grade by imperceptible degrees into the unattractive ones, it is perhaps self-evident that every additional burden, however small, transfers a percentage of such projects from commercial into uncommercial prospects.

The War's Lesson.

The benefits afforded the communities served by cheap power, and to the nation by the conservation of coal resulting from the substitution of a self-renewing for a non-renewable natural resource are far more valuable than is the exact solution of the question of restricting the returns to capital to their irreducible minimum. The present emergency due to the progress of the war has forcibly illustrated the importance of having developed the greatest possible number of water powers as a source of industrial power supply. As it consumes no fuel, the substitution of water for steam power would release to other uses all the extensive railroad and water facilities now engaged in transporting coal. It would similarly release a corresponding volume of labor now occupied in mining this coal and in operating such transportation agencies as well and the boiler-room forces of the steam-power plants themselves.

[The foregoing is taken from a report submitted to a special committee of the United States Chamber of Commerce on behalf of the Engineering Council.]

Photometry and Photometric Development Explained.—At the meeting of the Chicago Section of the Illuminating Engineering Society held in Chicago on January 17, W. A. Durgin gave an illustrated lecture on "Balancing the Light Beam." With the aid of ingeniously constructed special apparatus he demonstrated the principles of photometry. Special emphasis was laid on the inability of the eye to judge brightness values with any accuracy and of the relatively very low order of precision of all photometric measurements. The construction and use of various types of photometers was explained and the details were shown of the Sharp-Millar and Macbeth portable photometers, the foot-candle meter and the new relative-brightness meter or comparator which is now being developed by Mr. Durgin. In the discussion which followed the lecture, E. H. Freeman, J. R. Cravath and A. L. Arenberg called attention to numerous precautions that must be taken to enhance the accuracy of light measurements. Mr. Durgin admitted that most such work is comparatively rough, but usually answers all purposes if it shows the order of the intensity or brightness. After all, too much stress has been laid on the comparative efficiencies of competitive lighting equipments and not enough on their ruggedness, maintenance, ease of cleaning and other important operating features.

Editorial Comment

Weather and Economic Conditions Co-Operating to Boost Artificial Ice

IT seems as if nature is co-operating with the economic conditions throughout the northern part of the country in boosting the artificial ice at the expense of natural ice. Natural ice there is a-plenty, but it is largely un-get-at-able. The intense cold of the last few weeks, the universal and abnormal snowfall and blizzards instead of making ice plentiful for harvesting have had the opposite effect. The ice is there but it cannot be harvested. In many places it is so thick that ice cutters are unable to cut it, nor men to handle it. Deep snow has covered not only the ice but everything around it, and persists in doing so as often as cutting space and roadways are cleared. The cold has been so intense that the old-time way of sending ice to the store house, namely, by water channel, is now impracticable. The result is that the difficulties of cutting natural ice in these northern climes have increased many fold, whilst the labor for harvesting it is scarce and to large extent unprocurable.

The season when natural ice should be harvested is already well spent, with comparatively little ice cut and poor prospects of improvement in the near future. From all indications the season's harvest of natural ice must fall far short of preceding years, even after allowing for normal decrease due to competition with artificial ice.

The artificial-ice industry is not without its difficulties, however. Many of those plants that ordinarily would have operated are now closed under the coal conserving law. With present labor and material conditions few additional ice plants are in the building. At least one large central-station company has ceased encouraging or taking on of additional ice loads during this year, feeling uncertain of its ability to carry the load.

These things all mean that plants already in existence or those in course of completion will reap a harvest during the coming year because of the smaller quantity of natural ice available, because of the increasing use of ice per capita as the high price of foodstuffs proves the economy of the ice box, and, lastly, because of the curtailed growth of new plants.

The Maximum of Coal Production

A MEMBER of one of the industrial war boards, at a recent coal-consumers' conference, is reported as stating that the present rate of coal production in the United States was absolutely at the maximum. His statement may accurately apply to established mining properties under prevailing conditions, but apparently no account is taken of the possible output of new mines, nor of the development of coal lands to the stage of production. Our coal lands have been opened only partially.

The Alaskan coal fields, which might be made to yield a heavy output, have been merely scratched. The government railway, partly constructed between Seward and Fairbanks, will afford access to some of Alaska's greatest coal resources this year. Development of coal lands in that region was virtually stopped a few years ago by severe government restrictions; and now when the country's coal supply seems inadequate to meet the demands, these northern coal measures are still non-productive.

Alaska's coal resources are not a myth and, if ever, they should be drawn upon now to help meet the existing war-time demands, particularly for all bunkers on the Pacific Coast.

The opening of those coal veins and the haulage of coal to the seaboard are among the purposes to be served by the completion of the Seward-Fairbanks railroad and its branches. The Government owns and will operate that railroad, and experienced coal operators await the Government's initiative in a plan under which the co-operation of private capital may be secured. While methods of economy in the use of coal are being put in effect, the greatest improvement for the future depends upon an increased production, which is practicable, and the Alaskan situation offers only a tithe of the possible solutions. There are many other fields near the great manufacturing centers which should receive immediate attention.

The New Contractor-Dealer Organization

WE VOICE the sentiments of the entire electrical industry in extending a hearty welcome to the new National Association of Electrical Contractors and Dealers, which became a reality this week in St. Louis. While the association is new in name only it has adopted a constitution which has given the organization an entirely new scope of work and a much more extensive field in which to extend its influences.

The most important change over old conditions is the provision for extending the membership to include all retailers of electrical goods, whether such retailers be department stores, hardware stores, central stations or dealers exclusively in electrical supplies.

The crying need for such an organization has been obvious for many years, but it remained for W. L. Goodwin with his convincing exposition of the prin-

ciples of scientific merchandising to stir the retailers to action.

It is needless to refer to the effect that must result when manufacturers, jobbers, central stations and dealers all attempt to sell directly to the public, each with a different scale of prices, based on costs which are partially or wholly absorbed by other branches of their business. The chaotic conditions that have prevailed have undoubtedly greatly retarded the development of the industry. We are prone to boast of the wonderful progress of our industry which is still "in its infancy," but as a matter of fact our development has been largely engineering and we are far behind much younger industries which have not been hampered by internal friction.

The organization of the electrical retailers is therefore a step of the greatest importance to the industry. Backed by a great organization and fortified with statistics to prove their case they will be in a position to stabilize the distribution of merchandising through legitimate channels and thus work in harmony with the manufacturers, jobbers and central stations in serving the public.

It should, however, be clearly understood that the mere formation of the new association is not a "cure-all" for all of the ills of the industry. Conditions which have existed for 10 or 15 years cannot be changed over night. On the Pacific Coast it has taken practically five years to attain the ideal conditions which now exist. There is a vast amount of hard work to be done and every one must put his shoulder to the wheel.

Giving the Railroads a Chance

THE first staggering surprise occasioned by the order for complete cessation of industrial and commercial activity through the East and Middle West is past. The enforced idleness, so-called holiday, is over. Industry is once again getting into stride for the one big job that faces it—to win the war.

Whether such a radical and sudden command as was issued from Washington was necessary, wise or justified matters not. The question is whether the sacrifice by capital and wage earner has attained the set purpose. The order was given as a necessity to winning the war, and outside of tirades here and there and hysterical, unwise and hasty criticism, has accomplished its purpose. Had more time been given for preparing for an unprecedented situation less surprise and hardship might have been encountered; but then so also would greater opposition have had to be overcome, more appeals, and possibly less success. The enforced shutdown came suddenly, but conditions leading up to it have been forming gradually but surely. Then came the severe and sustained snowstorms and blizzards that have held the country in their grasp for more than two weeks. That was the crowning defeat for a failing transportation system. And the railroads failed. Then after days of sustained cold and snow-blocked railroads the Weather Bureau forecasted a mild spell with threatened return of a further blizzard. The Fuel Administrator saw the opportunity—and took it. While the milder weather endured all railroad traffic was devoted to clearing tracks and terminals of freight that had accumulated during weeks and months of almost hopeless muddle, and making clear a way for the passage of coal. The shutdown accomplished its purpose, in so far as time and weather permitted. But it was a big job; and time was short. Perhaps the country stands today where it would have stood had there been no blizzard, and no congestion on its account. Notwithstanding adverse criticisms and frenzied tirades, the action of the Fuel Administrator was a master stroke of strategy, for he promptly and bravely grasped an opportunity where with hesitation it would have been lost.

To call the shutdown a coal-conservation measure is, however, a misnomer. The shutdown was primarily to reduce the congestion of railroads and terminals of the promiscuous muddle of coal and freight that coal could be carried without undue obstruction. Narrowed down, the situation, as the Middle West sees it, is one created solely by failure of the national transportation system. The railroads are not big enough for the job. The movement of freight, raw materials, finished materials and fuel have assumed greater proportions than the railroads are capable of handling. Industry can produce faster than the railroads can transport their products and supply their needs. Goods have been delivered to the eastern docks faster than ships could take them away, and have piled up on wharf and track. Ships have been unable to get away for want of coal, coal within reach but unable to get to bunker because of the tracks ahead clogged with cars awaiting unloading upon an already overloaded wharf. Still cars and locomotives have been taken from the West to the already overcrowded East, while each additional car load of freight has multiplied difficulties and caused further congestion. England has had to send us coal to enable her ships to get away with their cargoes for the soldiers, while our coal has been within easy reach, so near and yet so far.

Co-operation is needed. Unified effort must obtain if further lost motion and still more hopeless confusion are not to result. It must now surely be understood that the coal miner, the railroad and the movement of cars, the coming and going of ships, the prompt unloading of raw material and loading of finished wares at the factory is each a link in the long chain that leads to victory. Lost motion and needless effort must be eliminated. Supply and demand, production and disposal must be synchronized, and the requirements of East and West harmonized into a homogenous unit, united, efficient and alert.

Transportation is the weakest link in our national status today. Through the fuel-saving order the railroads have been granted a respite, but how long before another may be required we cannot tell. The shutdown has partly served its purpose.

Week's Events

Utilities Co-operating with Government—Contractors and Dealers Meet in St. Louis—Other Electrical Happenings

ORGANIZED CO-OPERATION OF ELECTRIC AND GAS UTILITIES WITH THE GOVERNMENT.

Memorandum from the National Committee on Gas and Electric Service.

The subject which is probably paramount in the minds of every utility company throughout the United States is the coal situation. This has become so acute and the storage and supply of the various companies have become so diminished that many of them are facing an absolute shutdown. The reasons for this have been various—shortage of man power at the mines and on the transportation lines, lack of car supply, congestions and embargoes, and other troubles that have worked to the particular disadvantage of public utilities.

THE SHUTDOWN ORDER AND ITS EFFECT.

The Fuel Administration on January 17 issued what was considered by many as one of the most drastic regulations that any governmental agency has put into effect since the declaration of war. Most of the readers are undoubtedly familiar with the conditions of the order referred to, which is intended to help the situation. We would, however, call the attention of public utilities to the fact that by the issuance of this order the Fuel Administration has given particular preference to coal supply of public utilities; in fact, has advanced them to the place where their importance would seem to justify in the distribution of coal, and as this order is understood to cancel and suspend all previous priority orders that have been issued on the various coal operators to ship under special direct orders of the Fuel Administration, the coal supply for the various utility companies should go forward at a vastly increased rate during the life of this order.

There has been very little perceptible relief in the transportation of coal, lack of motive power and man power apparently being the principal cause of the trouble. Efforts are being made by the Director-General of Railroads to avoid cross-hauling and to use direct routes which in time should be very helpful. As an evidence of the unfortunate condition in which some of the railroads are in, a report was made to this committee within the last week that in one of the gas-coal mining regions there were 50 trainloads of coal waiting to be moved without any apparent motive power available for the purpose.

This committee has, as previously stated, placed at the disposal of the Fuel Administration two representatives who have their offices continuously in that bureau to handle the complaints of the public utilities and endeavor to obtain such relief as may be possible. The complaints that have reached Washington, both direct through the Fuel Administration and through the National Committee on Gas and Electric Service, from various public utilities vary from 100 to 200 per day. These complaints are promptly investigated and taken up in consultation either with the Fuel Administration or the Commission on Car Service as the nature of the complaint may warrant.

PRIORITIES IN GAS SUPPLY.

Several of the gas companies throughout the country are finding themselves rapidly getting into the same condition that some of the electric light and power companies have been in for some time—that is a demand for gas for industrial purposes which their plants are inadequate to take care of without some governmental agency or priority board making an investigation and deciding as to who shall be considered essential and who non-essential, and giving preference with governmental authority to those industries in the order of their importance in the manufacture of war material. This has been done, as is well known, in several of the large electric light and power companies, namely, Pittsburgh, Buffalo, Canton and other cities. This matter is now under consideration as to having investigations made in some of the gas companies where such demands are so rapidly increasing and having reports made as to just the status of the industrial and domestic consumption of gas in those communities.

At the very urgent request of Dr. Garfield, Federal Fuel Administrator, this committee has been asked to procure from the various gas companies throughout the United States the percentage of their output as accurately as possible that is supplied to industrial concerns manufacturing or producing war material. The questionnaire used by this committee to obtain the information is not at all complicated, and the replies should be forthcoming immediately.

The Fuel Administration has recently added to its staff a public utility representative in the Conservation Department of that Bureau, whose particular duties shall be to work out as much as possible the conservation of fuel in the operation of public utilities. Every assistance toward this end will be rendered by this committee.

Another member has been added to the National Committee on Gas and Electric Service, in the person of H. G. Bradlee, of Stone & Webster. Mr. Bradlee, as is well known, brings to the committee a vast knowledge and experience along public utility lines.

REQUISITIONS OF ELECTRICAL APPARATUS FOR WAR NEEDS.

The War Department in increasing the facilities for the production of important war material is constructing and considering the construction of many new plants which will require either the installation of a complete new power plant, or additions to present existing steam plants. This has brought about the necessity of requisitioning large electrical apparatus, including steam turbines, which are at present under order by the various public utilities with electrical manufacturers, and in order to disturb central-station

conditions as little as possible, this committee has been asked to co-operate with the War Department and on receiving its requests as to size and type of machinery required, the committee takes it up with the various central stations who may have orders placed for delivery at about the dates these machines are required by the Government, and selections are made that will, as above stated, disturb central-station conditions as little as possible.

PREFERENCES IN ELECTRIC POWER SUPPLY.

Some disturbance has been caused recently to electric light and power plants owing to manufacturers, who are at present being served by them, going ahead with additional construction work and extensions to their plants without first conferring with the central-station officials as to whether the power which they apparently depended upon getting for their extensions would be available. This has happened in a number of cases, and through no fault of the public utilities they have suddenly been called upon for a supply of electrical energy which their generating capacity is unable to meet, and the situation thus becomes complicated through it being necessary for certain industries who have enjoyed an uninterrupted service to have their service curtailed or even discontinued in order to take care of the additional demands made by the enterprise of greater importance who had made the more recent demands for service.

Several delegations of steel manufacturers and others making necessary war material have visited the committee with requests that it use its influence and assistance to render possible the extensions to certain central stations upon which they expect in the near future to make heavy demands for service. This is a much better method of approach than by going ahead with their own extensions without first finding out as to whether the electric power is available.

The committee is still endeavoring to obtain all the information possible regarding any excess supply of hydroelectric energy that may be available, which information is very much sought for by the Government with a view to establishing munition plants and other war-material manufacturing plants in the vicinity where such power would be available.

ENTHUSIASTIC MEETING OF CONTRACTORS AND JOBBERS HELD IN ST. LOUIS.

Goodwin Plan Discussed and Ratified by Missouri Contractors—Routine Business Taken Up.

A most successful and enthusiastic meeting was held in St. Louis, Mo., January 5 by the Co-operative Committee of the St. Louis Electrical Contractors, Jobbers and Dealers, and the state association of the National Association of Electrical Contractors and Dealers.

The meeting, which consisted of two-day sessions held in the Century Building, morning and afternoon, and a night session held in the form of a banquet at the American Annex, was well attended.

Fred Adam, state chairman of the Missouri Association, and also chairman of the Co-operative Committee, presided at both sessions. He was ably assisted in arranging for the meetings by W. F. Gerster, secretary of the state association, and by the local committees and members.

Beginning with the morning session, the following chairmen of standing committees delivered reports: Industrial Development, Gus Schwedler, of the Sparks Electric Company, Kansas City; Universal Data and Sales Book, O. L. Fickie, Union Electric Company, Kansas City; Liability Insurance, W. L. Hutchinson, Kansas City Electric Construction Company; Merchandising, J. J. Magee.

In the absence of E. L. Heath, chairman of the Credit Committee, W. J. Burton, of the Frank Adam Electric Company, St. Louis, presented a paper on "The Value to the Contractor of Trade Acceptances."

The time being limited, the following committees were unable to report: House Wiring, chairman, Robert B. Randall; Jobbers, W. A. Koeneman; Central Stations, George Gamp; Architects and Engineers, W. J. Sutter.

Additional committees were created as follows: Unit Prices, Chairman Ed. Allison, of the W. A. Corrao Electric Company, St. Louis; also Standard Forms; Accounting and Standard Costs, with the selection of chairmen deferred.

Three hundred and forty members of the industry attended the evening banquet, which was under the auspices of the Co-operative Committee of St. Louis Electrical Jobbers, Contractors and Dealers, whose Conventions and Meetings Committee, A. J. Burns, chairman, W. A. Koeneman and C. J. Sutter, was in charge.

William L. Goodwin was the speaker of the occasion, and presented the "Goodwin Plan" in a very clear manner.

At the conclusion of his address a general discussion of the plan was indulged in.

ELECTRICAL EXPORTS MAINTAIN FAIRLY LEVEL FIGURE.

September and October Totals Only Few Per Cent Below Average of Year.

Statistics of the foreign commerce of the country for last September and October just published by the Bureau of Foreign and Domestic Commerce show that electrical shipments in those months were considerably higher than during July and August, in fact, coming close to the average of the last 16 months. The following table shows the detailed figures for September and October and the comparative data for the corresponding months of 1916.

	September		October	
Articles.	1917.	1916.	1917.	1916.
Batteries	$ 187,665	$ 157,051	$ 275,721	$ 173,734
Carbons*	96,297	.....	127,271	.....
Dynamos or generators	106,784	108,453	196,146	249,281
Fans	65,558	23,593	29,276	13,949
Heating and cooking apparatus*	39,927	.....	63,840	.....
Insulated wire and cables	773,217	513,946	306,713	575,024
Interior wiring supplies (including fixtures)	64,713	71,840	100,345	89,214
Lamps—				
Arc	1,193	982	737	644
Carbon-filament	6,948	7,541	18,023	22,417
Metal-filament	205,793	86,539	240,686	103,655
Magnetos, spark plugs, etc.*	239,724	.....	283,272	.....
Meters and measuring instruments	111,906	85,395	80,689	80,895
Motors	456,117	327,727	546,255	528,666
Rheostats and controllers*	4,882	.....	23,343	.....
Switches and accessories*	166,299	.....	82,782	.....
Telegraph apparatus (including wireless)	17,707	10,671	16,609	18,366
Telephones	106,758	69,933	210,276	105,146
Transformers	88,660	103,251	224,975	90,367
All other	1,450,962	1,924,295	1,324,676	1,996,722
Total	$4,190,110	$3,491,217	$4,151,635	$4,048,080

*Included in "All Other" prior to July, 1917.

The comparative electrical-export totals for the ten-month periods ended October 31 for the last three years are as follows: 1917, $44,377,586; 1916, $31,075,703; 1915, $19,419,403.

REDUCE EXTENSIONS AS WAR MEASURE.

Commonwealth Edison Company Asks Utility Commission to Suspend Territorial Expansion.

As a war measure the Commonwealth Edison Company has appealed to the Illinois State Public Utilities Commission to allow it to refuse to extend its service into new territory except where the customer will bear the cost of extension. In giving testimony Mr. Insull said:

"Irrespective of the position of the public utilities companies as regards finances, I believe as a duty that all extensions requiring an outlay of money should be furnished by the consumer until after the war."

The petition asks the repeal of the rule which requires the companies to install extensions by erecting poles and lines to connect customers outside their zones of service and authorizing a system of reimbursement at certain intervals.

"Every dollar spent in extending our lines means just that much less of war business we can take care of," said Mr. Ferguson. "New and urgent demands are being made on us. One gun carriage factory, a $1,400,000 institution, surely a necessity of war, and a $500,000 chemical factory have arranged for power. They must be served.

"It is a question purely of finance, of raising money. We all hear about conserving food, coal and other necessities, but little about conserving money. The average man may not be as much concerned as the operators of large industries requiring large capital.

"We are manufacturers, sellers and transmitters, and in a business which with growth requires additional capital. Our 1918 budget as figured in the summer and fall was $7,770,000, but we postponed the installation of four large turbines and reduced our budget to approximately $3,500,000. Could capital be obtained under favorable conditions they would have been included. To put them in would mean more power with less consumption of coal, a matter in which the public is concerned as much as we."

The Public Service Company of Northern Illinois is seeking similar relief.

HEAVY INCREASE IN GENERATING CAPACITY IN THE NORTHWEST.

New Equipment Being Installed by Puget Sound Traction, Light and Power Company and Municipal Plants.

About March 1, the Puget Sound Traction Light and Power Company, Seattle, will have completed its new unit at the White River or Lake Tapps hydroelectric station. As before stated the foundations have been placed for a 16,000-kilovolt-ampere generator and water wheel. The generator unit has a capacity of 23,000 horsepower. Two generators, each with a capacity of 20,000 horsepower are already in operation at this station. To meet the industrial needs of Seattle and Tacoma a 13,000-horsepower generator will also be installed at the Georgetown steam plant and this additional capacity is to be in operation by summer. When this development is completed the hydroelectric plants supplying Seattle and Tacoma with power for industrial needs will have a combined capacity of 107,997 horsepower, divided as follows: White River, 63,000; Electron, 18,667, and Snoqualmie Falls, 26,330. The steam plant capacity will amount to 38,264 horsepower, 24,000 at the Georgetown plant, 6,667 at Western avenue, 4267 at Post street and 3330 at the Tacoma steam plants. This will make a total capacity of 146,261 horsepower, which is considered ample to take care of possible future demands of Seattle and Tacoma industries.

The White River or Lake Tapps development is the largest power project in the Northwest and its complete development is far from being attained. It is located midway between Seattle and Tacoma and was made by diverting the flow of White River at a high point in its channel into three natural lake beds lying high on the plateau, overlooking the lower White River valley. Twelve dams were built to create a reservoir and a channel cut from the upper river to this reservoir. By this means 2,500,000,000 cubic feet of water is impounded. The station is located on the valley level of the lower river and the water enters the penstocks from an outlet on top of the high ridge or plateau on which the lakes, Tapps, Kirkley and Church, now composing one body of water, are located. It has a head of 440 feet, and its large storage capacity makes it capable of still greater development.

In addition to the development of the traction company, the Seattle municipal plants, hydroelectric and steam, have a combined capacity of 24,000 horsepower. This the city is seeking to largely increase by the develpoment of a $5,000,000 project on the Skagit River.

Many New Members Secured by New York Electrical Society.

While the thermometers around New York City were registering extremely low temperatures early this month, the membership thermometer of the New York Electrical Society climbed steadily toward the boiling point. The mercury has passed the 180 mark and the top, 500, is certain to be reached long before the time set if the present pace is maintained. At the meeting of the Membership Committee held on January 16, plans were laid that should result in the enrollment of a great number of new members. Each committeeman pledged himself to enlist ten new members before the next weekly meeting. The responses received from the letter sent to members of the society urging them to secure new members, greatly exceeded the committee's expectations. Among those now enrolled are the names of some of the most prominent and influential officers of the railroad, telegraph, telephone, storage-battery and other electrical industries of the community. It was proposed at the meeting that a special effort be made to interest electrical contractors. This suggestion was followed up and the city divided into sections, each of which is to be thoroughly canvassed by one member of the committee. To these contractors will be explained the special benefits they are bound to derive from connection with an organization of this kind.

Schenectady Section, A. I. E. E. Meets.—At the 196th meeting of the Schenectady Section of the A. I. E. E. held on January 24 in Schenectady, Eskil Berg gave a lecture on "Advantages of High Steam Pressure and Superheat as Affecting Steam Plant Efficiency." The lecture was generously illustrated by lantern slides, and dealt with the distribution of losses in the turbine and to what extent and how superheat affects them. It was further explained how fuel economies approaching those of the Diesel engine can be approached by the use of higher steam pressures and superheat.

Organization of Contractor-Dealer Association Perfected

Executive Committee Meeting in St. Louis, January 22-23 Inaugurates New Organization

THE National Association of Electrical Contractors & Dealers became a reality on January 22, at which time the National Executive Committee meeting in St. Louis, Mo., concluded the official life of the old Electrical Contractors' Association of the United States, elected new officers and entered into a strenuous program for the continuation of the organization work of the new regime.

The St. Louis meeting, held in the club rooms of the Missouri Athletic Association, was an epoch-making one, which not only ushers in a new era in the electrical contracting and retailing field, but, it is expected, will be the first step in the ultimate reorganization of the entire electrical industry along more scientific lines, with the view to complete harmony between all of its branches.

The meeting was attended by the members of the Executive Committee and five invited guests, including James R. Strong, Ernest McCleary and W. L. Goodwin, who constituted the committee which drafted the new constitution. Col. Robley S. Stearnes, of New Orleans, who at the expiration of his term as president last October was induced to continue until the reorganization could be effected, called the meeting to order with the announcement that 22 states had ratified the new constitution. As the approval of only 14 states was necessary before final action and reorganization could be effected, the Executive Committee met with the feeling that the new work was being undertaken with even greater enthusiasm than had been expected, and the ratification by the remaining states was only a matter of arrangements to accord with existing state constitutions.

Election of Officers.

The first business of the meeting was the election of national officers for the new association. A nominating committee, composed of J. A. Fowler, W. D. Kohlwey and J. N. Pierce was appointed and after brief deliberations, the following nominations were reported and unanimously elected:

National Chairman, C. W. Peet, of New York City.

National Secretary, Harry C. Brown, of Utica, N. Y.

National Treasurer, Earnest McCleary, of Detroit, Mich.

At the New Orleans convention of the Electrical Contractors' Association, last October, it was decided to move the office of the Secretary from Utica, N. Y., where it has been located for the past several years, to Chicago, but in view of the need for the closest cooperation between the National Chairman and the Secretary during the coming year, and also because of the location of W. L. Goodwin in New York, this action was rescinded and a motion to move the office to New York City was unanimously carried. It was agreed by the Executive Committee that this was in the nature of a temporary measure and that ultimately headquarters would be permanently established in Chicago.

Report of President.

In turning over the affairs of the association to Chairman Peet, Colonel Stearnes presented a report summarizing the affairs of the organization and emphasizing numerous suggestions for needed measures. This communication was referred to a committee of two, whose report thereon recommended specific action on many of the features presented. Colonel Stearnes called attention to the increasing volume of work handled by the Secretary's office and the need for additional clerical help. He suggested the issuance of frequent bulletins from headquarters, dealing with current association topics; closer co-operation with the Conference Club in its relations with Government

C. W. Peet,
National Chairman.

H. C. Brown,
National Secretary.

Earnest McCleary,
National Treasurer.

work; the sale of the association data book to new members; greater membership activities, etc.

Amendments to Constitution.

James R. Strong offered some minor amendments to the constitution, which have been found necessary in the light of practical application. A new constitution was presented for adoption by the district association within states. Under Section 3 of the state constitutions a change was made to the effect that branch houses within the state shall pay dues based on the business transacted by such branch house, although no additional membership fee is required. A change was made in Article 6, Section 1, of the state constitution, providing for the management of the association. Instead of the Executive Committee being composed of one member elected by each district it was decided to make the election of Executive Committee members dependent upon population, rather than upon geographical considerations. The ultimate interpretation of this provision was left to the discretion of the state organizations.

On Wednesday morning there was a discussion of a suitable meeting place for the 1919 annual convention, numerous invitations being presented from various cities.

Other association details occupied the remainder of the session and the meeting adjourned to meet again in three months.

Entertainment Features.

Interesting diversions from the strictly business sessions were a meeting of the St. Louis Electrical League on Tuesday noon, at which members of the Executive Committee were guests, and a dinner tendered the Committee by St. Louis contractors on Tuesday evening. At the luncheon brief addresses were delivered by R. S. Stearnes, J. R. Strong and Earnest McCleary. W. N. Mathews, president of the League, occupied the chair and Fred Adam, of St. Louis, was chairman of the day.

Address of Mr. Goodwin.

The dinner was held at the Missouri Athletic Association. J. A. Fowler acted as toastmaster and at the close of an interesting entertainment program, provided by Mr. Sutter, addresses were delivered by C. W. Peet, R. S. Stearnes, J. R. Strong, Earnest McCleary, Mr. Tomlinson and W. L. Goodwin.

Mr. Goodwin's message was particularly impressive and sounds a warning that must be heeded if the work already accomplished is to be continued. He pointed out that the accomplishment of the new organization was but the beginning of the work which confronts the industry. First a strong organization, entirely representative of the field, must be built up and this naturally entails the accumulation of a bank balance. One of the first and most important duties then is the compilation of statistics relative to the contracting and retailing business, so that the contractor-dealer will himself know the importance of his field and, secondly, will be able to convince the other branches of the industry and obtain the consideration that is due.

He cautioned the association as individuals and collectively, not to be impatient for immediate results. The creation of a new organization he said did not signify that the innumerable ills of the industry will be at once relieved. It takes considerable time to effect lasting reforms and the co-operation of all members of the industry is essential.

ORGANIZATION OF THE WAR INDUSTRIES BOARD SHOWN.

Its Relation to the Nation's Chief Executive and Its Various Sub-divisions Made Clear by Diagram.

Much has been printed in relation to the War Industries Board and its various subdivisions and their activities. Not many who read of the doings of the Raw Materials Committee, the Priorities Board, the

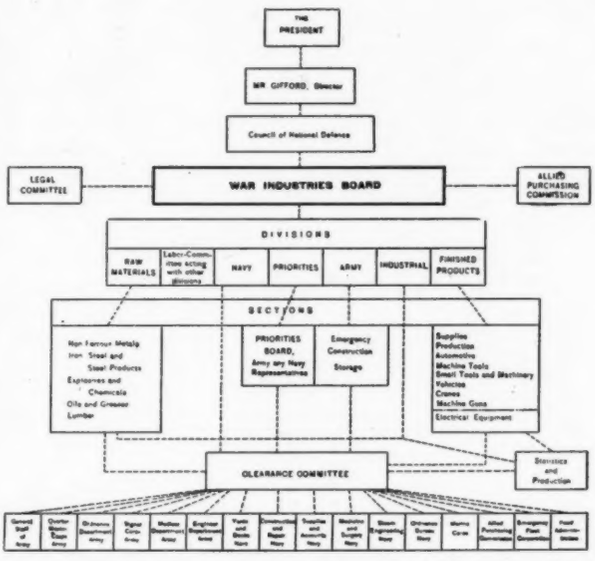


Diagram Showing Organization of War Industries Board of Associated Manufacturers of Electrical Supplies.

Clearance Committee, etc., have a clear conception of the relationship between these and all the other ramifications of the system which are being co-ordinated by the War Industries Board, and the workings of which are placed under the immediate observation of the President through the Council of National Defense.

The unofficial diagram here presented shows in skeleton form the organization of the War Industries Board as it was on December 6, 1917. It will prove of interest to many who are following this important work.

War Industries Meeting.

The chairmen of the War Service Group Committees of the Manufacturers of Electrical Supplies met Friday, January 11, at the offices of the Associated Manufacturers of Electrical Supplies. J. R. McKee and R. K. Sheppard, representatives of the Association on the General War Service Committee of the Electrical Manufacturing Industry, were present at this meeting. Further plans were outlined for mobilizing the electrical industry for the benefit of the Government.

All the manufacturing groups are now well on the road to effective organization. In this direction the Associated Manufacturers of Electrical Supplies is doing very effective work in this direction, both in and outside the industry. Data on the facilities of the various manufacturers, materials, etc., are being rapidly collected, segregated and tabulated.

The Board of Governors of the Associated Manufacturers of Electrical Supplies held their regular monthly meeting January 18, war service matters being the principal topic.

NEWS NOTES

General War Service Committee Appointments.—On January 4, R. K. Sheppard of the Simplex Wire & Cable Company was appointed chairman of the General War Service Committee and W. W. Nichols of the Allis-Chalmers Manufacturing Company was appointed secretary.

Minneapolis Meeting of A. I. E. E.—R. F. Pack, general manager of the Northern States Power Company and the Minneapolis General Electric Company, was one of the speakers at the meeting of the American Institute of Electrical Engineers at Minneapolis January 11. His subject was "Public Service Corporations and What They Have Done in the War."

New Oregon Power Site Reserve.—The Secretary of the Interior recently recommended, and the President has approved, the inclusion within a power-site reserve of about 196 acres of public land in the Big Sandy River Basin, Oregon, in order that this land may be used in connection with the development of power, but not for other purposes. Big Sandy River has its source on the western slope of the Cascade Range, and its principal tributaries are fed by the glaciers of Mount Hood. The land recommended for withdrawal is located near or adjacent to Big Sandy River below the mouth of Salmon River. The withdrawal for power-site purposes of a tract within the Eldorado National Forest, California, has also been recommended by the Secretary of the Interior and approved by the President.

More Illinois Central Stations Ask Rate Increases.—The Illinois State Public Utilities Commission has postponed the increase in rates sought by the Southern Illinois Light & Power Company, with headquarters at Hillsboro, until May 15, 1918. The Homer Light & Power Company, Homer, has applied for permission to increase rates on lighting in Homer and Sidney. Southern Illinois Light & Power Company, Morrisonville, has been authorized to increase its rates in Morrisonville. Saline Electric Company has applied to the Commission to increase its rates in Sparta, Ill. The Illinois Public Utilities Commission has accepted a new schedule of rates proposed by the Central Illinois Public Service Company for Girard, Ill.

Research Fellowships at University of Illinois.—C. R. Richards, dean and director of the College of Engineering, and Engineering Experiment Station, of University of Illinois, has issued a circular letter outlining the conditions of appointment to the Research Fellowships maintained by the Engineering Experiment Station of that institution. Attention is called to the fact that twelve vacancies will be filled in Research Fellowships at the close of the current academic year; and in addition to these there will be two Research Fellowships in Gas Engineering in that station, which feature is supported by the Illinois Gas Association. Nominations to these fellowships are made from applications received by the director of the station each year, not later than the first day of February, by the Station staff, subject to the approval of the executive faculty and the president of the university. Research work may be undertaken in electrical engineering, and virtually all other branches of engineering, and in theoretical and applied mechanics. The work of the Engineering Experiment Station is closely related to the College of Engineering. Further information may be obtained by addressing the director of the Engineering Experiment Station, at Urbana, Ill.

Utah Electrical Contractors and Dealers Meet.—Members of the Salt Lake district of the Utah Society of Electrical Contractors & Dealers held a meeting recently in Salt Lake City, in the rooms of the Commercial Club. Officers elected for the ensuing year are as follows: George R. Randall, president; G. W. Forsberg, vice-president; E. C. Wolters, secretary-treasurer; E. M. Dobb, R. C. Carter and James Swyers, members of the executive board.

Milwaukee Jovian League Hears War Address.—Dr. Lidgen, of the French army, was the principal speaker at the meeting of the Milwaukee (Wis.) Jovian League on January 17. He recited his experiences while at the front. The meeting was known as "Henry Newgard & Company Day," in accordance with a plan of the League to hold each of its regular meetings under the auspices of one of the prominent electrical companies of the city.

Doherty Club Established at Washington, D. C.—The Doherty Men's Club has been established at 1329 K Street, N. W., Washington, D. C., for the convenience of the men of the Doherty organization who have occasion to visit Washington. The 'phone number of the club is Franklin 1331. An average of half a dozen Doherty men from all sections of the country are in Washington at the same time and as hotel accommodations are not always convenient, this club will eliminate such difficulties, bringing the men together and mail or telegrams will be promptly taken care of. J. C. McDowell, in general charge of Doherty natural gas and oil operations, is president of the club; H. D. Williams, Buffalo, N. Y., counsel for the Dominion Natural Gas Company, Ltd., etc., is vice-presirent; George Williams, manager of the New Business Department, is chairman of the House Committee, and Carl H. Henrichson, formerly of the Toledo New Business Department, is secretary. The latter resides at the club and is responsible for its maintenance.

Many Central Stations Ask for Rate Increases.—A concerted move on the part of various Illinois light and power companies to ask a much needed increase in the sale of electric light and power will be made soon, it is believed. A preliminary conference regarding the greatly increased costs of operation and the stationary price for output has been held. Among those interested are H. E. Chubbuck, Peoria, vice-president executive of the Illinois Traction System; Marshall Sampson, Chicago, president of the Illinois Public Utilities Company, and R. S. Wallace, Peoria, general manager of the Central Illinois Utilities Company. The petition of the Perry Light & Power Company, Perry, to increase its rates has been deferred until the Illinois Public Utilities Commission can make investigations. The Canton Gas & Electric Company, Canton, has filed petition asking permission to increase rates in Canton, Bryant, Glasford, Norris and St. David. Saline Electric Company's (Chester) petition for advance in light and power rates has been postponed by the Commission until May 10, 1918. The Commission has also suspended until March 19, 1918, the increase sought for light and power service in Charleston and Pana, Ill., by the Central Illinois Public Service Company.

Operating

Laying-Up Boilers Safely—Indicating Romote Water Levels Simply—Seepage from Coal Causes Cable Failures

SAFETY METHODS FOR LAYING-UP BOILERS.

Suggested Precautions for Preventing Corrosion of Boilers While Out of Service.

By Lionel Linnell.

Scarcity of coal has increased the prospect that factories not actually engaged in making necessities and materials for the prosecution of the war may be forced to close down, temporarily at least. In a number of cases this winter, shortage and in some instances actual cessation of natural-gas supply has necessitated gas-fired boilers shutting down for from several days to weeks. So too oil-fired boilers are finding it increasingly difficult to obtain supplies of oil due to labor shortage, demand in excess of supply and railroad congestion. The result of all this is that boilers throughout the country are having to face the prospect of being laid-up for short periods, or periods of unknown duration.

Laying-up a boiler may be done in such a way that the boiler suffers no harm from remaining inactive; or it may be done so that the boiler deteriorates more rapidly than while in active operation, and very much more so. The way to protect a boiler from deterioration when laid-up depends upon how long it is to remain laid-up. In both cases it is rust, corrosion and chemical action that causes the trouble, but the way of overcoming these objectionable influences is different in the two cases. Where a boiler is to be laid-up for a short time, say, for example, for one to three months, the boiler is kept wet on the inner side of the heating surfaces; if for longer periods they should be kept scrupulously dry.

Short Period Lay-Up.

When a boiler is to be taken out of service for only a short time it should first be emptied of water and heating surfaces both inside and outside cleaned thoroughly, of scale and sludge on the inside and soot and slag and ash on the outside. The boiler should then be filled with water, clean and pure, to which has been added a fairly large quantity of soda ash. A fire should then be started in the furnace, a slow fire whose function is to drive out air entrained in the water and around the heating surfaces of the boiler. After this is accomplished the fire should be drawn and the boiler filled with water to the limit. A boiler so treated will stand laid-up for weeks without deterioration. The furnace should, however, also be cleaned and furnace doors left open so as to assure ample circulation of air through the gas passages.

Long Period Lay-Up.

When a boiler is to be laid-up for any length of time, as for example for six months, which is commonly the case with boilers used to assist hydroelectric plants during the summer shortage of water, etc., every part of the boiler should be kept scrupulously dry, both inside and outside.

The internal parts should be carefully and completely emptied of water and all deposits removed. All inner parts should then be washed out and the surface mopped to assure complete removal of water where it is thought water could lie stagnant. All ashes and other matter should be removed from the furnace chamber and grates should be cleaned, as also flues and brickwork. Soot should receive special attention because soot is liable to hold moisture as well as absorb it, and thus cause concentrated corrosion where such occurs. Tubes should be carefully cleaned and rubbed down for the same reason. Every precaution to prevent steam and water from entering the boiler from the feed-water system or the steam header should be taken, also that furnace gases from the breechings and stacks are not entering and condensing in the passages of the laid-up unit. Frequent inspection should be made whether water is leaking into the boiler through defective valve seatings. Many engineers take every precaution that air does not enter the boiler, whilst maintaining good air circulation through the furnace chamber and up the flue is advantageous, preventing condensation of moisture upon the surfaces. Many engineers place trays of lime in the boiler drums, thus absorbing whatever moisture exists. They also cover the furnace grates and place on top a quantity of lime, and keep the doors closed. Others again keep the furnace doors open, on the theory that ample ventilation is beneficial.

In inspecting a boiler, any boiler so far as that goes, after being laid-up, care should be taken not to use a naked flame as there is always a possibility of an explosive mixture existing within the furnace. Before laying-up a boiler it is, of course, advisable to inspect it carefully both before and after cleaning it and making whatever repairs are considered necessary. The unit will then be available for service on short notice.

A Simple and Reliable Water-Level Indicator.

By David R. Shearer.

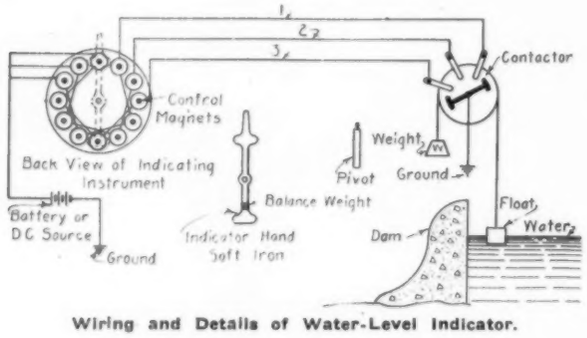
The accompanying sketch illustrates a remote water-level indicator which may be operated over three wires for any reasonable distance, although, of course, the voltage is necessarily increased with the distance. The mechanism may be operated by a battery or in some instances by current taken from an exciter set through a suitable resistance.

The sending instrument is nothing more than a wheel with two grounded contacts over which the cord carrying a float and weight moves. The two grounded contacts operate against three brass-strip brushes, making contact in the sequence 1, 2, 3 when the wheel revolves in one direction and in the sequence 3, 2, 1 when operating in the other direction.

The indicating arrangement is composed of a num-

ber of magnets set on end in circular form over which a soft-iron armature forming the indicating hand moves. The magnets may be placed on a hardwood board or other suitable support. The armature is pivoted in the center and balanced on this pivot so that opposite magnets may act with equal force at any instant. The magnets are connected very similarly to any three-phase winding of the star type and two are energized at all times, holding the pointer firmly. If the contactor moves one way, as for instance clockwise, the pointer moves in the same direction because the magnets are consecutively energized in that direction.

Any number of magnets can be used and each may be made to represent any number of inches or feet



Wiring and Details of Water-Level Indicator.

variation in the water level by proportioning the wheel over which the float cord passes. As a usual thing each step represents one foot rise or fall of the water level.

As will be noted from the sketch any contact energizes all the magnets of that phase but only the two contiguous to the armature have any effect in changing the pointer. If the two ahead become magnetized, the pointer is moved up one step and, if the two behind are energized, the pointer is moved back one step. No matter which way the contactor turns it must energize two magnets either directly behind or directly ahead of the pivoted armature, thus moving the pointer to correspond.

The instrument is easily made, accurate and durable and requires only three wires and a ground and the current consumption can be made very little by using magnet windings of high resistance.

A COAL PILE CAUSES CORROSION.

Cable Failures Emphasize Need for Draining Seepage.

A story comes from one large operating company concerning a coal pile that differs somewhat from ordinary ideas and considerations concerning the storage of coal. The coal, which had been obtained from Illinois and Indiana, was stored to the extent of about 20,000 tons in close proximity to the power house. The pile had been protected against spontaneous combustion by grading of sizes, by keeping the height of pile down to about 15 to 18 feet, and the exclusion of air as far as reasonably possible. In fact, all usual precautions for the coal had been taken.

From the power house a number of underground lead-covered paper-insulated cables passed alongside and very close to the pile of stored coal. Soon after the coal had been stored, ready for use in the spring or whenever necessity required, came the Indian summer, and then heavy rains.

Not long after the rains one of the cables broke down in the manhole nearest to the coal pile, and very soon another cable broke down in exactly the same place in the same manhole. Almost immediately the same thing happened again, but with a different cable. Now it is not uncommon for the same cable to break down twice and possibly three times in succession, the cause being charged to poor workmanship, damage by surge, absorption of moisture, and so forth. However, in the present instance it was a different cable each time, and as none of the three cables served the same load nor had, in fact, been heavily loaded, the cause of the trouble appeared to come from an external source rather than an internal one.

With the third cable failure came an investigation. The manhole was nearly full of water, the water level being, in fact, that corresponding to the height of the cables in the manhole. It was also noted that the odor in the manhole was more than ordinarily strong with an odor suggesting illuminating gas and sewage. The cable sheath of the broken-down cable was found badly corroded on the outside around the rupture due to the explosion following or rather accompanying the breakdown. Incidentally a closer examination of the splice showed that an exceptionally weak spot existed due to the solder between cable sheath and sleeve cap not having been wiped with sufficient care. Moreover, it was noticed that the corrosion was not confined to comparatively small areas here and there as is customarily the case where electrolysis is the cause of corrosion, but in rather extensive patches, suggesting attack by a corrosive liquid. There was also a strong suggestion that the seat of the trouble was at the water level of the water in the manhole. It was also noticed that the iron pipes used to support the cables in the manhole were badly corroded.

Samples of the water were taken and analyzed, also a section of the supporting iron pipe, and sections of the lead sheath of the cable taken out. The analysis of the water from the manhole showed brine and sulphates of iron and magnesium. Analysis of the deposits on the cable sheath showed the presence of sulphides of tin and lead, formed probably by the action of the hydrogen sulphide in the gas and water contained in the manhole. The presence of tin is most easily explained in that the solder of the cable sleeve had been corroded by the action of the brine and hydrogen sulphide upon it, and as this was eaten out, water seeped it—there is considerable capillary attraction in paper-insulated cables—causing immediate dielectric failure. The iron pipe supporting the cables, which was badly corroded, showed the deposits upon it to consist of oxide of iron and also the sulphates and sulphides of iron. The caps and sleeve of the cable splice contained sulphides of tin and lead with traces of iron, magnesium and calcium.

The explanation of this—the most probable explanation—is that the large quantity of brine contained in the manhole water was due to seepage from an adjacent sewer. The sulphates in the manhole water came from the coal pile. Presumably the sulphates aided corrosion, and due to local deposition and decomposition of the salts with free acids or brine weak places in the cable sleeves were found out. The reason as to why the manhole should be partially full of water after coal had been stored nearby, whereas it had been previously comparatively dry, is probably explained by the fact that the heavy rains had caused the coal pile to hold the water, which would otherwise have been drained off more quickly, the effect being equivalent to increased ground surface, while

the drainage has been concentrated into existing channels.

The remedy seems under these circumstances to at least try the use of asphalt paints around such cable sheaths as may be expected to be seasonally submerged in water. This coating of paint might with advantage be re-enforced with a wrapping of tape or similar binder. The possibility of corrosion from coal piles should, however, be borne in mind and cables kept as far as possible from large quantities of coal in storage. However, the choice of cable routing or space for coal storage are usually not matters of any degree of flexibility, hence it would seem advisable to consider the question of proper drainage from coal piles to make the cable sheaths, also gas and water pipes, as immune as possible from stagnant and corrosive fluids.

COMPARATIVE COST OF STEEL AND WOODEN POLE TRANSMISSION LINE.

Actual Costs of 100,000-volt Transmission Line of Montana Power Company Using Steel Towers and Cedar Poles.

Amongst the materials now extremely difficult to obtain is steel; moreover its price is high. The high cost and difficulties of obtaining supplies are preventing much construction work from being done in every field of activity. However, many central-station companies are having to meet additional loads and increases of those that already exist. Often the demand is sudden, urgent and unexpected; not infrequently the load will be for the duration of the war only, hence low initial cost is of added importance, always a wise and necessary measure irrespective of the extent or duration during which revenue will be obtained. Of late considerable thought has been given the subject of interconnecting various electrical power houses and transmission systems with the object of improving load-factor, reducing duplication and operating expenses generally and at the same time conserving capacity and fuel.

With the unsettled conditions, economic and industrial, at the present time, with the scarcity and high price of steel, difficulties as to delivery, and condition of the railroads, the choice between the use of steel towers or cedar poles is one that embraces not life alone, but such matters as that of delivery, ease of erection, initial cost of the line, etc.

The following figures should be of interest as showing the actual cost of constructing two transmission lines by the Montana Power Company, Butte, Mont., the one using steel towers, the other cedar poles. Both lines have the same cross-section of copper, the same insulators, and are in every respect similar as to carrying capacity except that in the one instance the supporting structures are single-circuit steel towers with horizontal cross arm, in the other cedar poles, two 45-foot poles being used to support an 8-foot cross arm.

The Great Falls-Butte transmission line uses the steel towers, which are spaced with a standard spacing of nine towers to the mile, with a spacing of 1000 feet over rough sections of the country. The East Helena-Josephine line using double poles has 45-foot cedar poles spaced 12 to the mile as standard spacing with spans of 1000 feet over rough country. These poles were supplied by the Linsley Brothers Company. In the following, to make the costs of the two lines strictly comparable, the cost of copper wire for the steel tower line has been corrected so as to be the same as that of the line employing cedar poles, a change made necessary due to variation in the market value between the time the two lines were built.

UNIT COST PER MILE OF WOOD POLE TRANSMISSION LINE NO. 0 COPPER WIRE, 100,000 VOLTS.

Supports	$ 203.80
Power wire	955.00
Ground wire	141.95
Telephone system	121.20
Power insulators	239.50
Power Cross arms	29.45
Power hardware	28.75
Line switches	21.55
Creosote treatment	60.50
Clearing	30.80
Hauling	149.40
Digging	61.20
Framing	40.20
Setting	43.80
Stringing	87.50
Guying	21.38
Guarding	3.59
Survey	39.80
Camp	67.50
Tools	14.62
Hospital—inj. and damages	6.10
Roads	0.13
General expense	55.00
Injuries during construction	0.77
Total	$2,423.49

UNIT COST PER MILE OF STEEL TOWER TRANSMISSION LINE NO. 0 COPPER WIRE, 100,000 VOLTS.

Towers	$ 615.38
Copper wire	955.00
Steel wire	141.95
Insulators	108.85
Hauling	181.33
Unloading	14.23
Digging	165.55
Setting	31.90
Assembling	77.17
Erecting	60.25
Stringing	117.52
Survey	20.40
Camp	122.33
Tools	28.71
Switches	115.38
Guying	46.24
Telephone	259.05
General expense	128.52
Total	$3,189.76

Entrained Air Causes Boiler Corrosion.

Air, which contains oxygen, is one very great source of corrosion, and it is the entrained air in water that causes so much trouble in boilers in the way of pitting. It has probably been noticed that pitting occurs most rapidly in the shell and other parts of a boiler at the prevailing water line. The reason usually advanced for this, and a sound one, is that the materials in the water become oxidized at the water line from contact with air and gas bubbles liberated from the water which gather and adhere at the surface and cause corrosion.

Entrained air is particularly likely to exist where exhaust steam from auxiliaries, hot-water drips and similar sources of waste are used for boiler feed. This entrained air may cause trouble by corroding and pitting boiler surfaces, valve seats, etc., and rust out the pipes through which the water flows, unless it is suspected and precautions are taken to guard against corrosion. One common way of getting rid of the entrained air consists of boiling the feed water at atmospheric pressure and in this way eliminating the dissolved oxygen. Boiling out the entrained air—deaeration of the water—can be done by the open-type of water heater.

Girls for Meter Readers.

The Binghamton Light, Heat & Power Company, of Binghamton, N. Y., has employed girls to read meters and deliver bills. It has been found advisable to do this on account of the general labor condition and it is in line with the policy adopted about six months ago of employing girls in all branches of the work where it is feasible to do so, thereby releasing as many men as possible for Federal service.

Construction

Croft on Conduit Bending—Syracuse Code—Ideas for the Home Electrical—Improved Hickey—Among Contractors

METHODS OF BENDING CONDUIT.

Third of a Series of Articles Describing the Best Practice.

By Terrell Croft.

To Shorten a Bend which has already been formed, for example the one shown in Fig. 11, a tube T of such diameter that it will slip over the conduit is used as a lever (see Fig. 12) and the end of the conduit, with the operator standing on it to hold it to the floor, is bent back so that the angle A is somewhat less than 90 degrees. Then the lever tube (T in Fig. 13) is slipped down further on the conduit and the latter then bent back to a vertical position. Thus the radius of the bend may be decreased from that of R_1 of Fig. 11 to R_2 of Fig. 14. That is, in this case the offset has been decreased from L_1 or 19 inches to L_2 or 11 inches, a shortening of 8 inches.

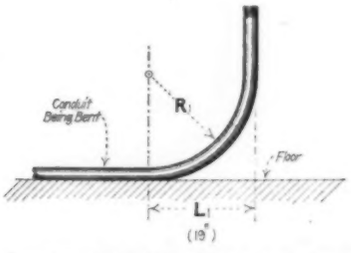


Fig. 11.—Showing the Elbow Which Is to Be Shortened.

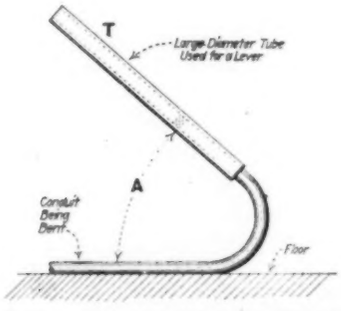


Fig. 12.—Method of Shortening the Bend—First Operation.

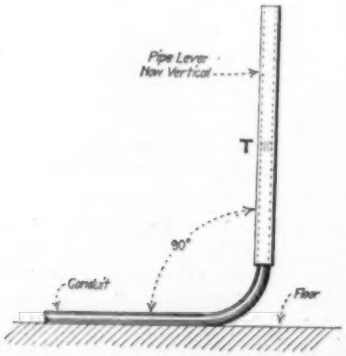


Fig. 13.—Shortening the Bend—Second Operation.

In a Multiple-Conduit Run the Conduits Should Lie Parallel, both in the straight portions of the runs and at the turns. Fig. 15 shows the appearance of a turn in a multiple run where the conduits do lie parallel to one another, while Fig. 16 indicates how the same run would look if standard elbows or bends, formed without any reference to symmetry, were used. To insure the systematic construction outlined in Fig. 15 it is necessary to lay out the contour of each bend with a chalk line on the floor and then form the turn to it. How this may be done will now be described.

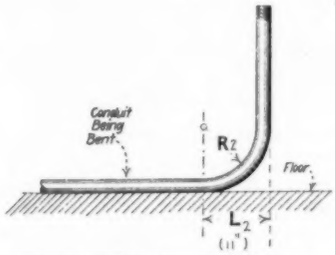


Fig. 14.—The Completed Bend.

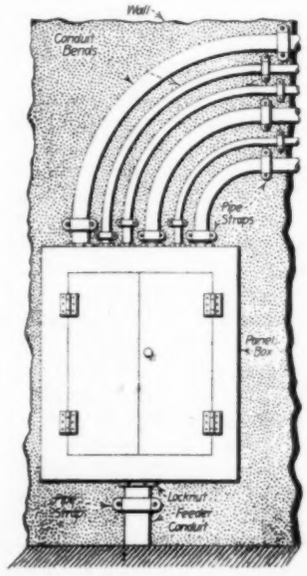


Fig. 15.—Showing a Right-Angle Turn Made in a Conduit Run with Symmetrically Bent Conduits.

In Laying Out Right-Angle Bends for conduit runs the procedure is as follows: First, see Fig. 17, draw a chalk line OA of any length (preferably 4 or 5 feet long) on the floor. Second, lay off the distance OB (Fig. 18) 4 units long. The units may be of any dimension. That is, 1 foot may be taken as a unit, or

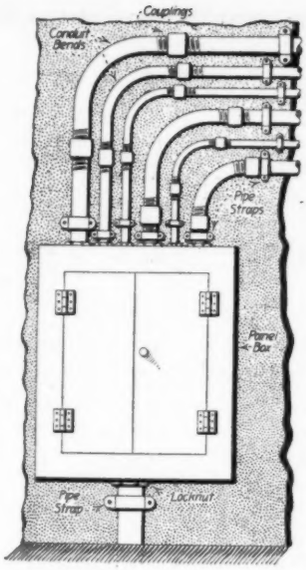


Fig. 16.—Showing a Right-Angle Turn Made in a Conduit Run with Conduit Elbows.

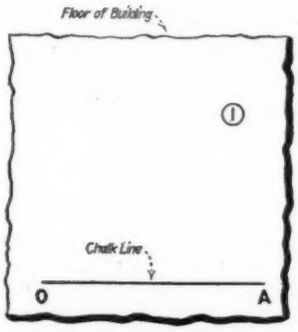


Fig. 17.—First Operation in Laying Out a Multiple-Conduit Bend.

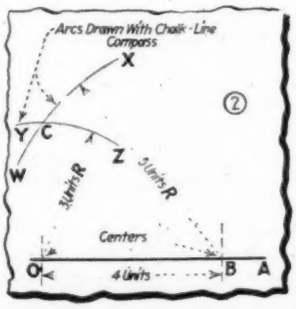


Fig. 18.—Second Operation in Laying Out a Right-Angle Multiple-Conduit Bend.

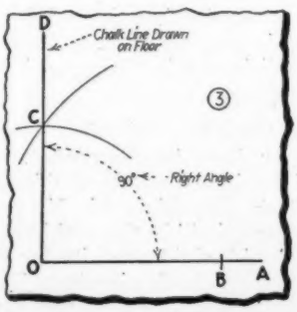


Fig. 19.—Third Operation in Laying Out a Multiple-Conduit Bend.

1 inch or 6 inches. However, 1 foot ordinarily affords a convenient unit. With a piece of chalk tied on the end of a length of string for a compass, and with *O* as a center and a radius of 3 units describe the arc *YZ*. With *B* as a center and a radius of 5 units

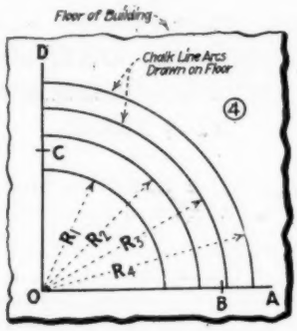


Fig. 20.—Fourth Operation in Laying Out a Multiple-Conduit Bend.

describe the arc *WX*. Now, draw a line *OD* through the intersection (*C*, Fig. 19) of the two arcs. The line *OD* will then be at right angles to *OA*. Now *OD* and *OA* may be prolonged to any required length. Then, with *O* as a center, the different arcs, to which the conduits of the multiple run are to be formed, are drawn on the floor (Fig. 20) with the chalk-line compass.

As suggested in Fig. 21, when a bend is being formed it must, from time to time, be laid on the floor at the side of the chalk line drawn for it, to insure the proper contour. It is usually desirable to

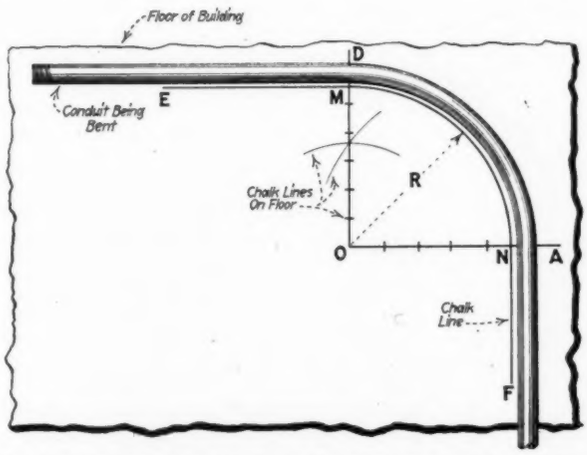


Fig. 21.—Showing How the Bend Should Be Formed to a Chalk Line.

draw the chalk lines *EM* and *NF* as part of the layout to assist the operator in the correct formation of the elbows.

(To Be Continued.)

New Electrical Code in Use in Syracuse, N. Y.

Commissioner Nicholson, of the Department of Public Safety of Syracuse, N. Y.. has announced that the new electrical code adopted by the Common Council has been put into effect January 9. The code provides, among other things, that "It is no longer necessary for hotel owners, owners of factories, etc., where electrical changes are frequent, to have an inspection

each time a change is made. If a licensed electrician is employed and a $10 license fee paid to the city, such owners may make changes at will, providing there is inspection each three months by the Bureau of Gas and Electricity."

THE HOME ELECTRICAL—IDEAS FOR ARCHITECT AND CONTRACTOR ON THOROUGH EQUIPMENT OF THE HOME.

Fine Publication by the Habirshaw Electric Cable Company and the Western Electric Company.

A publication of unusual character has been prepared jointly by the Habirshaw Electric Cable Company, manufacturer of wires and cables, and the Western Electric Company, the distributor of these products and of many useful electrical household appliances. It is entitled, "The Home Electrical" and contains plans and specifications for a typical residence. These two companies have established a definite working policy designed to deliver complete electrical equipment to the ultimate consumer at the lowest possible cost, consistent with dependable material and skilled workmanship. In carrying out this policy three features have been especially planned. (1) Preparation and distribution of correct plans and specifications for the use of the architect. (2) A duplicate of the architect's plans and specifications to be placed in the hands of the electrical contractor. (3) A practical working plan of distribution and a stabilized basis of cost from which contractors and architects can closely estimate their investments in materials and appliances in each installation.

The publication, which is being distributed to architects and contractors, contains typical complete plans and specifications that may be used by these interests, either in whole or in part, as an example to clients of an installation for a thoroughly modern home electrical. The data contained have been compiled from the most reliable sources and represent the best modern practice. The information supplementing the plans is intended to answer all questions that may arise between architect, contractor and owner in considering electrical equipment for the home. This is probably the only available compilation of this kind and has been indorsed by leading architects, contractors and electrical associations throughout the country as a constructive contribution to the industry.

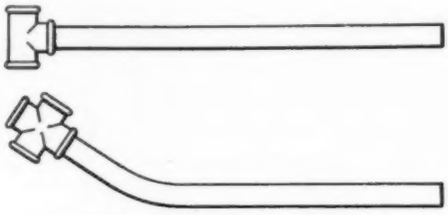
It is realized that the electrical contractor and the more enterprising architect appreciate the value of electricity in the home, but the owner as a rule needs to be educated. To carry out this educational work these two companies have launched extensive advertising in popular magazines of very wide circulation. A number of these typical advertisements are shown in the manual.

The plans shown are not detailed wiring plans, but are intended to show locations of outlets for lighting fixtures, wall receptacles and other convenient electrical household devices, such as washing and vacuum cleaning machines, refrigerator, ice-cream freezer, mangle, etc. A typical residence is shown and detailed plans are given of the basement, first, second and third floors, all being to scale and having in the margin numerous notations, symbols and other explanatory matter. Then follow two illustrated pages of wiring data, giving pithy suggestions for complete and first-class wiring of residences.

Improved Hickey Construction.

By A. Pertle.

The usual form of home-made hickey consists of about 3½ to 4 feet of 1-inch pipe and a "tee" fitting, as shown in the upper part of the accompanying sketch. I have found that a better way to make the hickey is to use about the same length of pipe with a bend or kink in it and a four-way pipe fitting instead of a tee. The lower sketch shows my construction.



Common and Improved Forms of Hickey.

The advantage of this is that the bottom hole can be used instead of reversing the hickey, as is frequently done (see Fig. 5 of Mr. Croft's article in the January 12 issue). The kink near the fitting often permits a stronger or more convenient hold to be obtained on the hickey and a more powerful bending action brought to bear on the conduit.

Among the Contractors.

The Blumenthal-Kahn Electric Company, Baltimore, Md., is nearing completion of the wiring in an ordnance factory for the Poole Engineering Company at Woodberry, Md. This is a conduit job throughout and costs about $25,000.

The Central Electric Company of Peoria, Ill., has the contract for rewiring about 700 outlets in a large store building for Clarke & Company, in Peoria. Included in the wiring is installation of an automatic call system and several outlets for tailors' electric pressing irons.

The United Electrical Construction Company, Philadelphia, Pa., has under way the contract for electrical installation in a large factory for the Lanston Monotype Company in that city, the cost of the building being about $140,000. The company is also wiring a $100,000 naval storehouse at Hampton Roads, Va.

The Freeman-Sweet Company, 608 South Dearborn Street, Chicago, Ill., has the contract for furnishing and installing all the electrical equipment in the new motor service building of Marshall Field & Company, the largest department store and wholesale drygoods establishment in Chicago. The building will cost about $400,000.

Russell & Company, 56 West Forty-fifth Street, New York City, have been awarded the contract for the electrical work in the new residence at 95 Maple Street, Flatbush, Brooklyn, N. Y., for William H. Todd. M. Trautschold is the architect. The work is being installed with rigid conduits for the feeders and BX cable for the branch circuits. The lighting fixtures will also be furnished by the Russell company. Bells and telephones are likewise included in this contract.

New Appliances

Sign Receptacles—Coffee-Urn Heater—Improved Three-Core Cable Construction—A Modern Electric Washer

New Sign, Outlet-Box and Concealed Receptacles.

Pass & Seymour, Inc., Solvay, N. Y., which was one of the first electrical manufacturers to make what is now known as sign receptacles, is about to place on the market a receptacle that will be known as No. 437. This device is of the well known screw-ring type which fits the common 1½-inch hole. The principal advantage of this device lies in the fact that the body of the receptacle proper is but 13/16 inch in depth. This allows the wires to be carried the proper distance from the surface wired over and effects a material economy of space because it does not extend back far from the face of the sign or, when used in outlet boxes, it does not extend from the outlet-box cover as

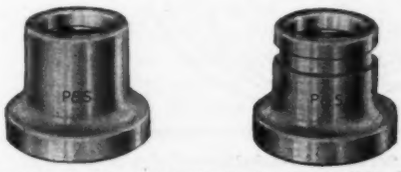
New Short-Backed Sign and Outlet-Box Receptacles, Nos. 437, 40003 and 4035.

far in the box as the common receptacle. The new device may well be classified as a "short-backed receptacle."

Provision is made in the back for pouring in weatherproofing compounds, thereby entirely covering the metal parts. The manufacturer states that the receiving shell for the lamp is very rich in copper and yet has sufficient alloy to render it a dependable and rigid member. This lamp shell is retained in the receptacle by means of phosphor-bronze screws of special strength, which readily permit the removal of the shell for the lamp, without disturbing the terminal plates in the back of the receptacle.

A ball-tipped spring-center contact of phosphor bronze guarantees continuous contact with the base of the lamp. This is an important item because the usual location of these receptacles, when installed, is remote and hard to get at, therefore any feature which adds to the durability and permanency of the device makes frequent attention unnecessary by the caretaker.

The terminal binding screws are sturdy, broad-headed screws with a massive shank carefully threaded into the heavy terminal plates and so located that the wires, when connected, center exactly in the deep raceways in the porcelain body.



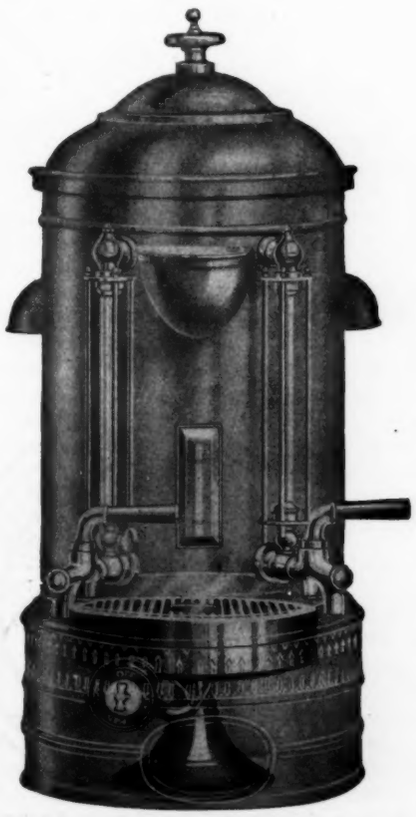
New Porcelain Concealed Receptacles, Nos. 4000 and 4001.

Another new receptacle, P&S No. 4003, which is a companion piece of No. 437, is a short-backed receptacle furnished with six-inch leading-in wires. P&S No. 4035 is a new screw-ring sign and outlet-box receptacle of the same family as Nos. 437 and 4003 and differs from the latter only in that it has a one-inch back.

Two other new devices (P&S Nos. 4000 and 4001) are new porcelain concealed receptacles. The wires are introduced from the back of these receptacles. The outer porcelain shell entirely conceals the supporting screws as well as the binding screws and terminals. No. 4000 is without shade-holder groove and No. 4001 has a shade-holder groove. The outside diameter of the base of these receptacles is 2 5/16 inches.

Electric Heater for Coffee Urns.

Herewith is illustrated the practical use of the electric coffee-urn heater, a new device of the Edison Electric Appliance Company, successor to the Hughes Electric Heating Company, Chicago. The heater has an adjustable base, whereby the burner may be raised to contact with the urn. The burner is heavily in-



Hughes Electric Coffee Urn Heater.

sulated with an asbestos composition block, thereby conserving the heat and confining it to the bottom surface of the urn, giving little, if any, radiation at the sides and bottom. Three separate heat temperatures are available, with perfect control. Thus, a test with an 880-watt heater under a 3-gallon urn, with the three temperatures, gave these results: Urn contained 3 gallons of water at 120 degrees F. High heat, or 880 watts, brought water to boil, at 212 degrees, in 75 minutes; medium heat, or 440 watts, maintained the boiling temperature of 212 degrees; low heat, or 220 watts, held a temperature of 170 degrees for 16 hours. Other tests were made with a 1500-watt heater under a 5-gallon urn. The electric coffee-urn heater is made in four sizes of 880, 1100, 1500 and 1800 watts, and has black enamel base, with switch finished in gun metal.

IMPROVED CONSTRUCTION OF THREE-CONDUCTOR, THREE-PHASE CABLES.

Development of Hochstadter and Davis Patents for Surrounding Each Insulated Conductor with Metal Wrapping to Eliminate "Hot Spots."

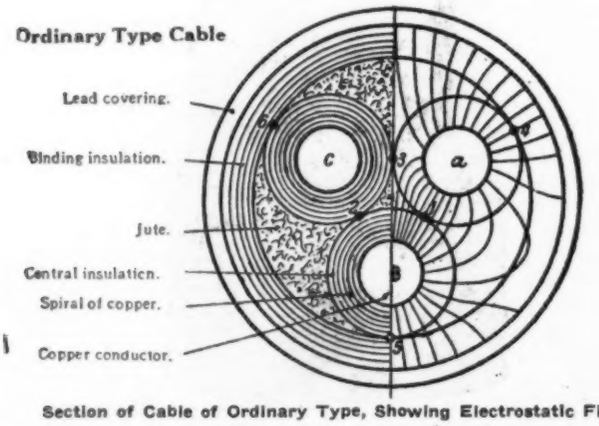
In the London *Electrician* of May 19, 1916, there appeared an article by M. Hochstadter on high-efciency three-core cables. This article called attention to the tendency of three-conductor, three-phase cables of ordinary type to develop "hot spots" and resultant charred insulation at the center of the cable under certain conditions. Mr. Hockstadter called attention to the fact that this detrimental action may be eliminated by the simple expedient of dispensing with the belt insulation and increasing the insulation on the conductors, each of the separately insulated conductors then being wrapped with a metal covering, which is grounded continuously or at intervals to the sheath of the cable. The author pointed cut that by this type of construction the rotary field at the center of a three-core cable, when operating three phase, is eliminated.

Others have noted the same tendency in three-core cables of ordinary type to overheat at the center, and Davis in his patent No. 1,132,451, specifically referring to this tendency, proposes to minimize it by increasing the distance between the cores, and in his second patent of the same date, bearing No. 1,132,452, he suggests another alternative, namely, the use of copper coverings of high thermal conductivity over portions of the boundary of the conductor insulation.

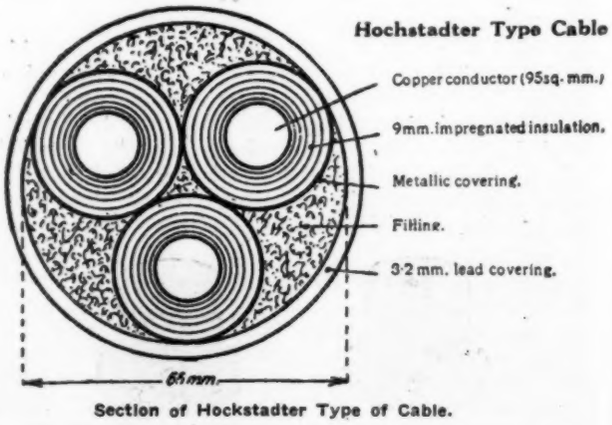
A perusal of the above mentioned article and of the patents issued to Mr. Hockstadter (German patent No. 288,446 of November, 1915, and United States patent No. 1,199,789 of October, 1916), makes it apparent that while he had in mind the use of wrappings of material of high thermal conductivity, such as copper (mentioned in his German patent), he apparently relies for his improvement in cable construction less upon their thermal conductivity than upon the benefits derived from the improvement in the electrical conditions. Contrasted with this we have Davis' improvement. In the latter's second patent, referred to above, he apparently adopts the point of view that the overheated central portion of a cable is more or less directly the result of the inability of that portion of the cable to dissipate its heat, and he provides paths of high thermal conductivity from the center of the cable to the sheath.

It need not concern us which of these two points of view is correct. The main thing to be borne in mind for present consideration is that by the adoption of this construction, as shown in the cuts herewith, using those metals for Hochstadter's metallic shield which will have the highest thermal conductivity and in sufficient thicknesses to dissipate the heat from the center of the cable in an adequate manner, there is secured in a highly perfected form, cable which for low and high voltages, particularly on grounded-neutral systems, is a distinct step in advance in the art of cable manufacture.

The thickness of copper required in this construction to adequately perform the functions of field control and thermal conductor is at most but a few thousandths of an inch. Even with very heavy currents in the conductor, of the highest frequencies used in practice today, namely, 60 cycles, the eddy-current loss in a continuous sheath of this sort, when made of high-conductivity copper of a few thousandths of an inch in thickness, will be but a few per cent of the I^2R loss in the conductor. Obviously, the production of a continuous copper sheath is unpractical. The natural method of applying such a covering is to make use of tapes of such width, and applied in the same manner, as would naturally be pursued by those familiar with the art of cable manufacture in order to secure sufficient flexibility. A small space is preferably left between the edges of such tape by means of which impregnation of the paper insulation of the cable may be better accomplished. The application of the Hochstadter shield in this manner obviously still further reduces the eddy-current losses, as is pointed out by Field (English patent No. 319 of 1904), in connection with a somewhat similar construction he makes use of for a ground shield on three-core cable. In point of fact this method of construction practically eliminates eddy-current losses, even under the worst conditions,



Section of Cable of Ordinary Type, Showing Electrostatic Field.



Section of Hockstadter Type of Cable.

namely, where the Hochstadter shield is applied to cables carrying very heavy currents, such as might be used in three-conductor low-voltage service.

The Hochstadter United States patent, referred to above, was applied for March 27, 1913, and allowed October 3, 1916, and is owned by the Standard Underground Cable Company, of Pittsburgh, Pa., to which it was assigned by the inventor in 1913. This company calls attention to the many advantages to be derived from the use of this type of construction. Cables made by this company, after the teaching of Hochstadter and Davis in the early part of 1914, where the wrappings were made of copper tape 0.5 inch in width and 0.002 inch in thickness, have a degree of flexibility which is entirely suitable for most purposes and, while the wrappings are thin enough to make good contact with the insulation, they are sufficient in thickness to give ample thermal conductivity for carrying away the heat generated at the central portions of the cable.

It will be noted that while this type of construction more directly applies to high-voltage cables it may, under certain conditions, be advantageously used on low-voltage cables of three-conductor construction, since, even where the dielectric loss may be inappreciable at high temperatures, there will nevertheless be an advantage in securing the lower insulation temperatures attainable by this method. Obviously, the greatest gain in low-voltage cable using this type of construction will be where only one or two cables are installed and where it is desired to operate them at very heavy current loads. Where a great many low-voltage three-conductor cables are operating in adjoining ducts, the advantages attainable by this type of construction are less pronounced and in some cases hardly warranted by the increased expense, because in congested duct systems the temperature drop between the conductors and the cable sheath is usually but a small portion of the total drop of temperature between the conductors and the surrounding earth, and thus, even if the copper wrappings increased the thermal conductivity of the insulation to infinity, the gain in carrying capacity for equal insulation temperatures would of necessity be small.

Were the metallic wrappings nothing but heat conductors, their presence would be of the same but no greater value in high-voltage cables than just indicated for low-voltage cables. The fact that they are electrical conductors also, however, entirely changes the matter and high-voltage cables thus constructed are advantageously used either when operating singly or when operating in large groups in close proximity as may be necessary in congested duct systems.

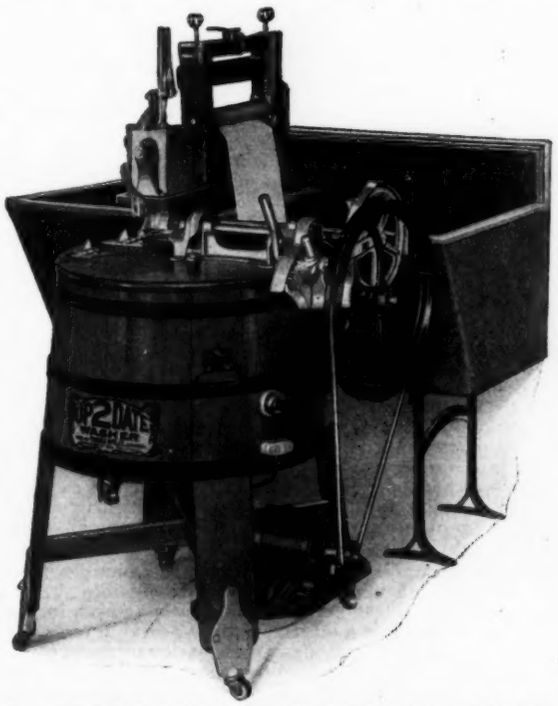
The Standard Underground Cable Company expects to issue a bulletin and other data in the near future giving more details concerning these cables.

Motor-Driven Dolly-Type Washers.

Scarcity of household servants and especially of laundresses is causing housewives to undertake their own clothes washing and this means a greatly increased demand for washing machines, of which the electrically driven ones are the ideal type. A new electric washer has been placed on the market by the Thistle Manufacturing Company, 325-329 North Curtis Street, Chicago, Ill., which incorporated many of the best features of washing-machine construction, for which reason it is known by the trade "Up-2-Date."

This machine has a tub of kiln-dried red cypress mounted on well braced legs with casters for easy movement about the laundry. The driving motor is of 1/6 horsepower rating, either direct current or alternating current. It is belt-connected to a large flywheel, thus giving a flexible drive and relieving the motor of excessive sudden strains. The gears are all machine cut to give smooth, efficient running and they are well covered to guard against damage to the clothes or operator. The bearings are babbitted. For clothes agitation there is a self-adjusting dolly, which makes from 80 to 90 rotations and reversals per minute. A galvanized cap covers the dolly shaft, preventing injury to the clothes.

The wringer is of good construction with rolls of the best quality rubber obtainable. It is controlled by a handy lever at the side, which starts, reverses and stops it instantly. There is also a safety release lever, a slight pressure on which loosens the wringer rolls and thus prevents injury to the mechanism or to the clothes should the latter become choked in the rolls. The wringer can be operated while the washer is running or independently and can be swung around to convenient positions by merely pressing a special lever. This latter feature permits wringing from the machine to the rinsing tub, from the rinsing tub to the bluing tub, and from the latter to the clothes basket; both the two latter operations can be performed while a new batch of clothes is being churned and washed in the machine, thus effecting a great saving of time.



The "Up-2-Date" Home Electric Washer With Swinging Wringer.

Every part of the machine is substantially built and well finished, so that with the up-to-date features it possesses it makes a high-grade appliance of great utility and value.

Big Increase in Electric-Cooking Load of California Company.

Eight hundred and ten kilowatts of electric cooking and heating apparatus were added to the lines of the Western States Gas & Electric Company in the Lodi, Cal., district, during 1917. The following appliances were placed in active use during the period: 83 electric ranges, 71 water heaters, 75 room heaters, 1 disc stove and 231 other appliances.

Trade Activities

Bulletins, Calendars and Catalogs Distributed—Manufacturers Opening Branches and Appointing Representatives

The Crescent Electric & Manufacturing Company, Pittsburgh, Pa., is reported to have bought the entire stock of the Pittsburgh Armature Works. The Crescent company with this added equipment is in position to take care of any kind of armature work.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a service station at 535 First Avenue South, Seattle, from which to handle service in the State of Washington and the Northwest. It announces, also, the removal of its Seattle sales office to the location given herein, to continue in charge of C. Kirk Hillman.

Trimont Manufacturing Company, 55-71 Amory, Roxbury, Boston, Mass., is sending out a catalog on its tools, made under the trade-mark Trimo. Trimo basin, chain, giant chain, monkey, pipe and wood handle narrow jaw wrenches and accessories are described, priced and illustrated. A table of standard wrought iron and steel pipe dimensions is also given.

Frankel Solderless Connector Company, Inc., with offices and works 177-179 Hudson Street and 27-29 Vestry Street, and sales rooms 733-35 and 1140-46 Broadway, New York City, advises that the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is now its exclusive sales agent in the United States for all its manufactured products. The Frankel company's material will be stocked by the Westinghouse company at all its branches.

United Printing Machinery Company, with main office 100 Summer Street, Boston, and branch offices in Chicago and New York City, has issued a folder on the Chapman electric neutralizer. This is a simple equipment for eliminating troubles due to static electricity on rotary, flatbed, lithographic and offset presses, which are extremely annoying during the cold, dry months of winter. The action of the neutralizer is explained and the experience of one printing establishment is given. A partial list is also given of printers who have used Chapman neutralizers for several years.

Stow Manufacturing Company, Binghamton, N. Y., inventor and manufacturer of the Stow flexible shaft, and said to be the oldest portable-tool manufacturer in America, is distributing a booklet on Stow portable tools. This booklet illustrates and describes various types of drills for different uses, bench and tool post grinders, Stow flexible shaft center grinder, portable emery grinders (electric and rope driven), electric hand buffer, flexible shafts, clamp spindle stop clutch, motor-driven Stow screw driver, Gee Whiz machine and other tools, which are mostly electrically operated. The company will supply Bulletins 101 and 102, describing its tools, which are produced by the builder, backed by 42 years' experience. Many manufacturers are successfully using them every day and they play a prominent part in the production of munitions.

The Fidelity Electric Company, manufacturer of motors, generators, fans, rotary converters, electrical machinery, etc., of Lancaster, Pa., is finishing the erection of a new factory building adjoining its old buildings, with a floor space of about 27,000 square feet and two stories high, so as to permit ample daylight. The building just completed, which is 240 feet long, extending one-half block, will be used for the assembling and winding departments, giving increased space in the old buildings for the other departments, including the machine shop. It will be occupied immediately following the Lancaster County Automobile Show in the company's building, which will be held next month. The company found it necessary to add this space to enable it to care for its rapidly increasing business since it added to its line of polyphase motors in all sizes up to and including 30 horsepower.

V. V. Fittings Company, Philadelphia, Pa., is now represented on the Pacific Coast by the Baker-Joslyn Company, 526 First Avenue South, Seattle, Wash. The Baker-Joslyn Company, with headquarters at San Francisco, and of which H. H. Manny is Seattle manager, has taken on the complete line of conduit and marine fittings of the V. V. Fittings Company.

Superno Company, Inc., 52 Broadway, New York City, is distributing a catalog on its Superno patented steel superheaters. This catalog, which has a number of illustrations and installation diagrams, shows the application of Superno superheaters to boilers of the stationary type, but they are, however, as readily adapted and installed in boilers of the marine type and locomotive type, using either coal or oil for fuel and information regarding such applications will be furnished upon request.

United Gas & Electric Engineering Corporation, 61 Broadway, New York City, presents much interesting matter in its January issue of The Bulletin, its monthly publication. This covers facts about the various departments of the utility concerns operated under the supervision of the principal corporation. The matter comprises current information relating to sales records made, cooperation in aid of government war preparation, new equipment installed, work planned for 1918, window displays, the development of small power business, and personal sketches.

Wirt Company, manufacturer of electric lighting appliances, Germantown, Philadelphia, issues a letter of January 8 to its friends, the sales managers, commenting on one of the new ways of putting the salesmanship idea, which is: "Very little is bought in these days. Things are sold." Emphasis is placed on the proposition that the salesman must sell. The sales booster, who signs this letter, not only urges the sale of the company's Dim-a-lites, but all other lines of its products, thus rounding out results desired. These constitute the introductory to an appeal to salesmen to pull together for business results for 1918.

Edison Lamp Works of General Electric Company, Harrison, N. J., is sending out a very artistic 1918 calendar. The picture shows a maiden at sunrise on a ledge of rocks hanging over water. The mountains in the distance, a tree nearby, and the water are radiant with the sun's early morning rays. The top of the picture shows an Edison Mazda lamp casting its beam in all directions. The picture proper is a reproduction of an oil painting specially designed for the Edison Lamp Works by Maxfield Parrish, illustrator and mural painter. This beautiful calendar is unusually interesting from the fact that it has been reproduced in 17 printings, something that it is said has never before been attempted in commercial lithography. The inspiration of it is aptly expressed by the words of Shakespeare, "And night is fled, whose pitchy mantle overveiled the earth."

George Cutter Company, South Bend, Ind., is distributing copies of its new bulletin No. 3337 on Sol-Lux industrial lighting reflectors and fixtures. This bulletin will appeal to users of this line of lighting equipment, which is exceptionally complete. Considerable information on the subject of industrial lighting is given and its value is pointed out in a clear way. The characteristics of Cutter reflectors and holder sockets are explained with the aid of distribution curves and illustrations, showing details of construction, so as to guide the purchaser in the proper selection of the reflector best suited for his purpose. Among the reflectors and fixtures listed and illustrated are reflectors made of one piece, reflectors with standard heels, also with snap-ring holders; fixtures of the pendent, bracket, entrance and store sign types; Reflecto-Cap Diffusers are also shown and described. Copies of the bulletin can be had on application to the company.

Western Electric Company has leased 45,000 square feet on the thirteenth and sixteenth floors of the building just completed on the north side of Twenty-first Street, from Broadway to Fifth Avenue, New York City. This lease is for a term of years at an aggregate rental of $200,000 for a distributing office.

Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a new folder on the Hubbell line of interchangeable attachment plugs and T-slot receptacles. The advantage of having plenty of convenient outlets is pointed out and the adaptability of the Hubbell devices clearly set forth by aid of over 30 illustrations of flush and surface wall receptacles, fixture and other receptacles, current taps, attachment plugs, multiple plug bases, etc. The construction of "Knostrain" caps is also well shown.

Westinghouse Church Kerr & Company, Inc., engineers and constructors, with main office 37 Wall Street, New York City, are distributing a brilliant color print of the potash works of the Mineral Products Corporation, the first refined potash plant in the United States, located at Marysvale, Utah, 200 miles south of Salt Lake City. Upon the discovery of a 28-foot vein of alunite in Marysvale, the engineering ingenuity and ability of Westinghouse Church Kerr & Company was employed to design and construct a plant to convert this ore into potash. The processes involved in the conversion of alunite are intricate and the difficulties, due to the inaccessibility of the location, were many, but these engineers and constructors, as usual, proved equal to the situation and the new plant is now treating 150 tons of ore a day, which means a yield of 30 tons of potash in the form of sulphate. Owing to the war stopping our importation of potash, of which in normal times the United States imported from Germany about $12,000,000 worth, and its great importance in application to soil to yield food for ourselves and our allies, and its other uses, the significance of producing our own potash can readily be realized.

The Robbins & Myers Company, with main office and factory at Springfield, Ohio, and with branches and agencies in all the principal cities of the United States and foreign countries, has just issued a striking little catalog, No. 1117, on Robbins & Myers' electric fans. These fans, which are for alternating and direct-current circuits, are of the non-oscillating, oscillating, ceiling and ventilating types. They can be furnished in special sprayed enamel or electro-plate finishes to match the finish of interiors where appointments require particular harmony of finish. Each fan is carefully made and thoroughly tested before entering the packing room. The catalog gives a number of clean-cut illustrations and descriptions of the various types and accessories, and tells of their particular uses. The Robbins & Myers' hat-cleaning motor is also described and illustrated. Telegraphic code for quotations, orders, shipments, express companies, etc., is conveniently listed in the back part of the booklet. The cover designs of this catalog are very appealing and show two youngsters in their cribs, scantily clad, surrounded by toys and kittens, presumably on a very warm night, joyfully reaching out toward the cool currents produced by nearby active Robbins & Myers' electric fans.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., to stimulate dealer interest and co-operation has begun the issuance of a monthly publication, January, 1918. This new paper is to be known as "Contact," and is the same size as the Saturday Evening Post, to permit effective display of its contents and full scale reproduction of advertisements in national mediums. The new magazine will replace the Westinghouse Company's monthly, "Merchandising Calendar," and also the special publications distributed on merchandising campaigns, which are issued from time to time throughout the year. The intention is to make "Contact" a clearing house of ideas for Westinghouse distributors. Whether these ideas cover window display, stock accounting, stock arrangement, canvassing or any merchandising problem, they will be welcome in its columns. New sales ideas, successful campaigns, plans for more business, for bigger profits, for better service from employees are being solicited by Westinghouse representatives throughout their trade. The first issue contains articles on getting rid of after-Christmas stock; bigger profits by better planning of advertising according to a definite schedule; sales letters that "bring home the bacon," and the value of the proper spending of our money in winning the war. "Contact" is sent gratis to dealers in Westinghouse supplies and appliances.

Menominee Electric Manufacturing Company, manufacturer of motors, telephone and electrical goods, is removing from Menominee, Mich., to Cairo, Ill. It is reported the company is building a plant at Cairo, which is being erected for it by the Kelly Construction Company.

Driver-Harris Company, Harrison, N. J., maker of wire, strip and strand, announces that it is now prepared to supply 99 per cent cold rolled pure nickel sheets. Many former uses for this metal have been abandoned, due to the inability of manufacturers to secure the necessary raw material, since the start of war. This new and reliable source of supply will be appreciated by manufacturers who are interested in the use of the metal.

Beardslee Chandelier Manufacturing Company, Chicago, announces that it has secured the services of J. B. Beel, one of the best known fixture designers in the country. Mr. Beel was for twelve years with the T. W. Wilmarth Company. During that time he designed some of the most artistic fixtures in use in the electrical field, among them being the lighting fixtures used in the Cook County Court House; the Blackstone Hotel, Chicago; Davenport Hotel, Spokane, Wash.; Oregon Hotel, Portland, Ore., and many other notable installations.

George Cutter Company, with main offices in South Bend, Ind., is sending out the second edition of Cutter Handy Wiring Tables and Illumination Data. The first edition was compiled and issued in 1896. The tables have now been brought up to date and additional material has been included, especially on the subjects of illumination and on the application of lighting equipment to industrial and other purposes. The booklet, which also shows a part of Cutter electric lighting fixtures, such as holder-sockets, Sol-Lux reflectors, Universal flood-lighting projectors, wall brackets, etc., is issued complimentary to those interested in the more efficient use of electric light.

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has just published two small six-page circulars. One of these is entitled "C-H Electric Space Heater Unit," and describes a steel-jacketed unit, which is approximately the size of a two-foot rule. A number of applications of this unit are described, giving several suggested ways of mounting. The circular also makes note of the fact that these heater units are now put up in standard packages of ten units each, carrying a label at each end so that the boxes can be easily identified when on the shelves of the stockroom. The capacity of each unit is 500 watts and they may be used on either alternating or direct-current circuits. The other circular is entitled "C-H Electric Air Heaters." These heaters are divided into a number of groups, several being for industrial or mill use, made in capacities of from 2 kilowatts to 10 kilowatts. Other heaters are illustrated and are particularly desirable for offices, bedrooms, bathrooms, etc., and have a better appearance than the mill and industrial type of heater. The dimensions, ratings and prices are given in the folders referred to.

The Trumbull Electric Manufacturing Company, of Plainville, Conn., has accepted an invitation of membership in the Rice Leaders of the World Association, New York. This company enjoys a distinctive position the world over as a manufacturer of electric switches, panel boards, armored cable and kindred specialties. As a member of this organization its position will be enhanced by an affiliation with other worthy concerns making up the membership. The association is an organization of leading manufacturers, co-operating to maintain the highest business standards in every department of operation. Members are identified by a co-operative emblem which sets forth by word and symbol the qualifications for membership in the association as follows: A laurel wreath stands for Honor—"A recognized reputation for fair and honorable business dealings." A wheat sheaf represents Quality—"An honest product of quality truthfully represented." A lion rampant, signifies Strength—"A responsible and substantial financial standing." Mercury, a speed courier, typifies Service—"A recognized reputation for conducting business in prompt and efficient manner." The mission of this association is not only to point out worthy products, but to indicate to all men the sterling principles which underlie the manufacture of these products. It tells the world the truth about its members, and that truth is simply and convincingly expressed in the association emblem and defined in the qualifications for membership. The Trumbull company has joined in the work of the Rice Leaders of the World Association to co-operate with other high-grade manufacturers in keeping before the public mind high standards of business principles and merchandise quality.

Men in Service

E. B. and W. A. Strong in Service—United Gas & Electric Engineering Well Represented—G. E. Tripp Appointed

W. H. Stevens and Clarence C. Salisbury, who were two of the six draftsmen of the Rochester Railway & Light Company, Rochester, N. Y., chosen to go to Washington recently to assist in the Ordnance Bureau of the War Department, report being engaged in interesting work. Mr. Salisbury is at work in the Trench Warfare Department.

Lieut. Edward B. Strong, Jr., of Company F, 159th Infantry, and W. A. Strong, electrician in the U. S. Naval Radio Service, are members of the editorial and managerial staff of the Journal of Electricity that have entered service. Lieut. Strong is treasurer of the Technical Publishing Company, publisher of the Journal of Electricity, and has been actively engaged in its behalf for several years prior to his present service with the Government at the National Army Camp at Linda Vista. W. A. Strong, his younger brother, is now somewhere in the Pacific, in charge of radio service for the Government. These young men are sons of E. B. Strong, president of the Technical Publishing Company, and are typical of the spirit of the Great West in their enthusiasm and patriotic fervor for service in the cause of democracy.

United Gas & Electric Engineering Corporation, with headquarters 61 Broadway, New York City, in its January issue of The Bulletin, lists the names of 389 men, employees of the company and subsidiaries, who have entered Government service. The number of employees listed from the various companies represented are as follows: Birmingham — Birmingham Railway, Light & Power Company, 98; Bloomington—Union Gas & Electric Company, 2; Buffalo—International Railway Company, 50; Colorado Springs—Colorado Springs Light, Heat & Power Company, 5; Elmira—Elmira Water, Light & Railroad Company, 10; Harrisburg—Harrisburg Light & Power Company, 2; Houston—Houston Lighting & Power Company, 18; Houston Gas & Fuel Company, 12; Knoxville—Knoxville Railway & Light Company, 9; Lancaster, Pa.—Conestoga Traction Company, 23; Edison Electric Company, 7; Lancaster Gas, Light & Fuel Company, 5; Leavenworth—Leavenworth Light, Heat & Power Company, 1; Little Rock—Little Rock Railway & Electric Company, 23; Lockport—Lockport Light, Heat & Power Company, 1; Memphis—Memphis Street Railway Company, 52; New Orleans—Consumers Electric Light & Power Company, 8; New Orleans Gas Light Company, 4; New Orleans Railway & Light Company, 45; New York—United Gas & Electric Engineering Corporation, 4; Richmond — Richmond Light, Heat & Power Company, 1; Terre Haute—Citizens Gas & Fuel Company, 2; Wilkes-Barre—Wilkes-Barre Company, 7.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

The Electrical Review will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.

Guy E. Tripp, of New York, heretofore chairman of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed

Guy E. Tripp.

by the War Department as chief of the Production Division of the Ordnance Bureau, intrusted with the task of supervising and stimulating the production of all ordnance supplies. The appointment of Mr. Tripp, who is commissioned colonel, is one of the important steps in the reorganization of the Ordnance Bureau, announced recently by its chief, General Crozier.

Mr. Tripp was selected for this important duty because of his experience in the manufacture of munitions of all kinds, the Westinghouse company having obtained large contracts from the British and Russian Governments immediately on the outbreak of the European war. He is credited with bringing to the Department the highest obtainable type of experience and ability to insure speedy and careful production of munitions. The board of directors of the Westinghouse company has given him a leave of absence for the duration of the war.

J. A. Royster, electrical inspector for Martinez, Cal., for the last three years, is now with the U. S. Army. Mr. Royster is master signal electrician of Company C, 322d Field Signal Battalion, stationed at Camp Lewis, Wash.

A. R. Thompson, of the distribution department of the Pacific Gas & Electric Company, has resigned to accept a commission as captain of engineers in the United States Reserves. S. J. Lisberger, of the distribution department of the company, will have direct charge of Mr. Thompson's former duties and will act as chief engineer of the San Francisco district in both steam and electric work.

Guy A. Richardson, superintendent of railway, of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been called to Philadelphia by the International Mercantile Corporation to assist for a time in solving the problems of transportation to and from its plant at that place, where thousands of men are employed in constructing steel ships for the United States. Charles A. Stone, of Stone & Webster, is president of the International Mercantile Corporation.

H. O. Clarke, Jr., commercial manager of the Houston Lighting & Power Company, Houston, Tex., has received an appointment from the Government to assist the local aviation construction and field officers in an advisory capacity in problems concerning their electrical installations at the local army cantonment. This appointment follows closely Mr. Clarke's election as Jovian Statesman for Texas, in recognition of his activity in electrical and business affairs in Houston.

F. Emerson Hoar, who for the last five years has been head of the gas and electric department of the California Railroad Commission, has left for Petersburg, Va., for three months' training as a captain in the Engineers' Corps. Mr. Hoar, who was born in Kern County, California, 40 years ago, served during the Spanish-American War with Company I, First California Volunteers, the regiment which took Manila. After the war he remained at Manila for two years, working there as a civilian in engineering work. Within the last year Mr. Hoar has had charge of very important studies in connection with oil resources, industrial power rates and, in fact, all of the larger problems brought before the commission in which gas and electric utilities are involved. The California Railroad Commission released him with great reluctance from his important work, which also included the investigation of the feasibility of interconnecting transmission line systems of California and otherwise conserving fuel and power generally.

Personal

V. R. Despard Opens Own Business—F. H. Smock Secretary of Sheboygan Contractors—M. Rupert Promoted

W. R. PUTNAM, division manager of the Utah Power & Light Company, Salt Lake City, Utah, has been made a director of the Utah Manufacturers' Association.

O. S. YAGER is now municipal superintendent of Eaton Rapids, Mich., having resigned as assistant to general manager of the Logan County Light & Power Company, Logan, W. Va.

J. H. DUFRESNE has become auditor of the Minneapolis General Electric Company, Minneapolis, Minn. He resigned as auditor and assistant treasurer of the Choctaw Power & Light Company, McAlester, Okla.

FREDERICK W. JOHNSON of the Puget Sound Traction, Light & Power Company, has been appointed assistant to E. C. Macy, in charge of construction work for Stone & Webster in the Northwest, and will have his headquarters in Seattle, Wash.

A. C. BRADLEY, superintendent of the northern division of the Pacific Electric Railway, Los Angeles, Cal., has also been appointed superintendent of the eastern division of the company, to succeed M. P. Groftholdt, the two divisions being consolidated.

NORTON L. TAYLOR, who has been engineer in the department of light and water, Tacoma, Wash., for several years, has been appointed special engineer to make the surveys and estimates on the increasing of the storage of the Nisqually basin of the power plant.

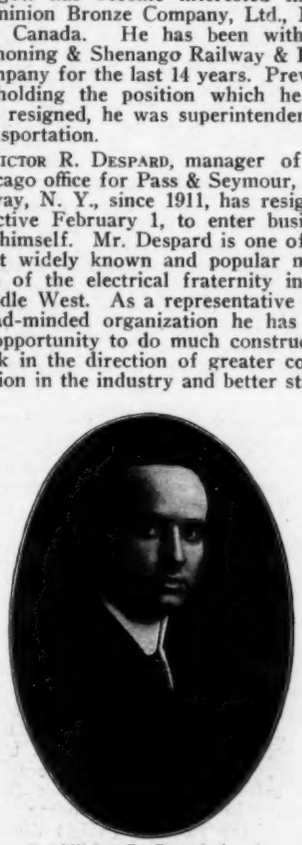
JAMES E. DAVIDSON, vice-president and general manager of the Nebraska Power Company, of Omaha, Neb., has been elected president of the Nebraska Section of the National Electric Light Association. He was president of the Vermont Electrical Association in 1909 and president of the New England Section of the National Electric Light Association in 1910-1911.

F. H. LANE, who is manager of H. M. Byllesby & Company's department of exemptions and reports, New York City, will have temporary charge of the engineering and construction department, succeeding W. R. Thompson, now captain in the Army, located at Battle Creek, Mich., and A. H. Sayce, who has joined the second officers reserve camp at Fort Sheridan.

D. C. JACKLING, San Francisco, who has been given charge of facilities for supplying explosives needed by the Government, will supervise the construction of a government powder plant near Nashville, Tenn., estimated to cost $60,000,000. Mr. Jackling formerly was managing director of the Utah Copper Company, and in a similar manner controlled extensive mining and milling operations in Arizona and New Mexico. In these operations he directed large forces, was a heavy user of explosives, and provided electric power on a big scale at those properties.

M. C. MCELLIGOTT has resigned as superintendent of employment of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio. Mr. McElligott has become interested in the Dominion Bronze Company, Ltd., Preston, Canada. He has been with the Mahoning & Shenango Railway & Light Company for the last 14 years. Previous to holding the position which he has just resigned, he was superintendent of transportation.

VICTOR R. DESPARD, manager of the Chicago office for Pass & Seymour, Inc., Solvay, N. Y., since 1911, has resigned, effective February 1, to enter business for himself. Mr. Despard is one of the most widely known and popular members of the electrical fraternity in the Middle West. As a representative of a broad-minded organization he has had an opportunity to do much constructive work in the direction of greater co-operation in the industry and better standardization in merchandising and sales methods and his efforts in this direction have made him a factor in electrical development. Mr. Despard entered the electrical business in 1906 as a salesman for the Mohawk Electrical Supply Company. After serving two years with this company at its original location and later at Syracuse, N. Y., Mr. Despard became associated with Pass & Seymour, Inc., in the sales department. For three years he covered territory in Syracuse and vicinity and then, in 1911, was appointed manager of the Chicago office, which position he has filled continuously since. Mr. Despard will enter the manufacturing field, namely to manufacture electrical wiring devices. The name of the new company is Despard & Gordon Company, incorporated in the State of Illinois, with headquarters in Chicago. The company expects to have its product ready for the market in May. Mr. Despard will enter his new work with the confidence and best wishes of a host of friends.



Victor R. Despard.

W. D. CLARK has succeeded R. S. Dunning as secretary of the Cleveland Electric Club, Jovian Chapter, Cleveland, Ohio.

WILLIAM M. WATSON has been appointed superintendent of the municipal electric light plant at Owensboro, Ky., succeeding E. H. Briedenbach.

HARRY F. BUTLER, Lehighton, Pa., formerly connected with the Consolidated Telephone Company, has been appointed manager for the Lehighton Electric Light Company.

N. C. KINGSBURY, vice-president of the American Telephone & Telegraph Company, tendered an address at a luncheon held by the Rotary Club, Buffalo, N. Y., on "The Telephone in War."

S. A. KETCHUM, sales manager of the Western Electric Company, 500 South Clinton Street, Chicago, has been made a member of the Civic Industrial Committee of the Chicago Association of Commerce.

EDWARD M. COOKE, second vice-president and general manager of the Keystone Telephone System, has been elected a director of the Keystone Telephone Company, Philadelphia, Pa., and the Keystone Telephone Company of New Jersey.

P. H. CHASE, formerly assistant engineer with the Public Service Electric Company, Newark, N. J., has become associated with the American Railways Company, with headquarters at Philadelphia, Pa., in the capacity of electrical engineer.

T. R. STEINGOETTER has been appointed manager of the St. Louis County Gas & Electric Company at Edwardsville, Ill. He has been serving the company as a traveling auditor and more recently as general auditor in East St. Louis. He began with the company as messenger boy in the Belleville (Ill.) office.

C. E. GROESBECK, vice-president and general manager of the Utah Power & Light Company, Salt Lake City, has resigned. About February 1 Mr. Groesbeck goes to New York City to join the Electric Bond & Share Company. The latter company is the fiscal agent of the Utah Power & Light Company and the Utah Light & Traction Company. Sydney R. Inch succeeds Mr. Groesbeck with the Utah Power & Light Company.

F. H. SMOCK, sales manager of the Eastern Wisconsin Electric Company, Sheboygan, Wis., has been elected secretary of the Sheboygan division of the Wisconsin Association of Electrical Contractors & Dealers at a recent meeting of that body. The division over which Mr. Smock will have supervision includes the counties of Calumet, Door, Manitowoc, Kewaunee and Sheboygan. At the meeting the members went into the Goodwin plan of securing harmonious action among the various interests of the electrical industry.

WILLIAM S. KIES, vice-president of the American International Shipbuilding Corporation, Philadelphia, Pa., has resigned as a vice-president of the National City Bank and will hereafter devote all of his time to the work of the American International Shipbuilding Corporation.

MARK L. REQUA, Oakland, Cal., recently appointed head of the oil division of the national fuel administration, by which fuel oil supply will be controlled, is a mining engineer with much experience in oil production. An investigation of all phases of petroleum production, distribution and consumption will be made under Mr. Requa's direction. Power production on the Pacific coast is divided between fuel oil steam plants and hydroelectric generating stations.

CHARLES WELLMAN PARKS, the well known engineer, has been named by the President to be Chief of Bureau of Yards and Docks, Navy Department, to succeed Rear Admiral Frederick R. Harris, who resigned several weeks ago, when he became general manager of the Fleet Corporation. Civil Engineer Parks is now public works officer at the naval station at Honolulu, Hawaii, which position he has held since January, 1915, and has had charge of the building of the dry dock at Pearl Harbor and other important works.

A. S. LINDSTROM, who is now general manager of the Thordarson Electric Manufacturing Company, of Chicago, which has recently undergone a reorganization in all departments, is well known in the industry through his connection with the St. Louis and San Francisco World's Fairs. He was assistant chief and director of high-voltage research work in the Machinery Palace at the San Francisco fair. After the fair he became western representative for the Thordarson Electric Manufacturing Company, which position he held until he came to Chicago to take up his present work.

W. H. MCGRATH, vice-president of the Puget Sound Traction, Light & Power Company, has been named Washington State representative of the traffic committee of the American electrical railway board with offices in Seattle. One of the first duties which will fall to him will be the carrying out of the scheme suggested by A. L. Valentine, superintendent of public utilities, who requested that steam railroad transportation be provided for employees of the shipbuilding plants and other industries in the manufacturing center to the heart of the city.

A. R. BONE, general commercial superintendent of the Chicago Telephone Company, has been elected general secretary of the Chicago Association of Commerce. Mr. Bone has been connected with the Chicago Telephone Company for about 20 years, first as a solicitor, next as manager of the Aurora District, then as special agent in the suburban division and later as special agent in charge of collections and special matters in the City of Chicago. He became commercial superintendent September 1, 1912, and general commercial superintendent April 1, 1914, succeeding W. Rufus Abbott. He is a prominent worker in the Electric Club-Jovian League of Chicago and December 4, 1913, was elected its president. He also has considerable dramatic talent and has taken an active part in various entertainments.

WILLIAM D. REYNOLDS, Freehold, N. J., has been reappointed engineer for the court house and jail heating and power plant.

RUSSELL T. GRAY, formerly with the Shuman Advertising Company, has embarked in business for himself as an advertising engineer, with offices in the First National Bank Building, Chicago. Mr. Gray, who is a well known engineer, believes that there is a wide field for that particularly specialized branch of engineering he has entered.

MILTON RUPERT recently was elected vice-president and assistant treasurer of the R. D. Nuttall Company, of Pittsburgh, Pa., manufacturer of gears, pinions and trolleys. Mr. Rupert has been with the Nuttall company since March 4, 1893, filling various positions. In 1903 he was appointed head of the general offices, being directly in touch with all office matters and also manufacturing operations. During the latter part of this period he was assistant to president and general manager. In his new position Mr. Rupert will have charge of sales and manufacturing activities.

ALFRED D. FLYNN, deputy engineer of the Board of Water Supply, New York City, has been elected secretary of the Engineering Council, secretary of the Engineering Foundation, and secretary of the United Engineering Society. The Engineering Council was formed in the fall of 1917. The United Engineering Society is the governing board of the Engineering Societies Building into which the Civil Engineers recently moved, and the Engineering Foundation is the founder organization of the societies which originally combined into the one organization. These activities therefore now center in one man.

F. M. NOURSE has joined the advertising department of the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., in the capacity of technical writer. Mr. Nourse is a graduate of the electrical engineering course of the University of Illinois, class of 1912, since which time he has been engaged in various branches of engineering work. After graduation, several years were spent with the Northern Illinois Utilities Company, after which he became a motor sales engineer for Roth Bros., Chicago. In 1915 Mr. Nourse took charge of the Portage (Wis.) division of the Wisconsin Power, Light & Heat Company, and later became associated with the Electrical Engineers Equipment Company, of Chicago.

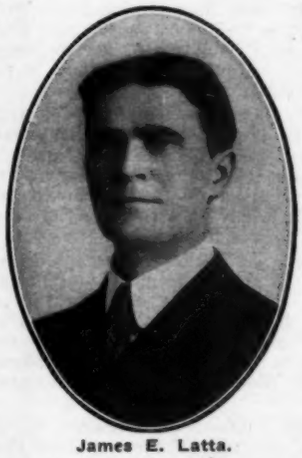
OBITUARY.

FRANK N. VOSHELL, connected with the Public Service Electric Company, Camden, N. J., in the capacity of engineer at the power plant, died January 11 at his home, 1181 Lawrence street, aged 42 years.

WLLIAM H. TRUSWELL, a member of the firm of William Truswell & Sons, New York, electrical contractors, died January 13 at his home, 446 Fourteenth street, South Brooklyn.

MALCOLM ALEXANDER, formerly superintendent at the plant of the Brooklyn Union Gas Company, died January 11 at the home of his daughter, Mrs. Grace Parkin, 721 Sterling place, aged 88.

JAMES EDWARD LATTA, general agent of the Underwriters' Laboratories, died after a short illness at Washington, D. C., January 17. He was a graduate of the University of North Carolina, the state of his birth, and of the Graduate School of Harvard University. His engineering training was obtained at the Polytechnic Institute of Brooklyn, at Stevens Institute of Technology, and at the shops of the Westinghouse Electric & Manufacturing Company, and those of the Hooven, Owens, Rentschler Company. In 1903 he was appointed assistant professor of physics in the University of North Carolina, soon becoming acting head of the department of physics and applied electricity and after a year and a half being made professor of electrical engineering. While serving his old alma mater until 1909, Mr. Latta frequently was called upon as a consulting and supervising engineer in various parts of the country. In 1909 he became associated with the Harrison (N. J.) works of the General Electric Company, where for seven months he conducted an employees' educational course in applied electricity and illuminating engineering. Subsequently he was engaged in power-plant construction and operation in the Southwest. In the summer of 1911 he became technical editor of ELECTROCRAFT; when that publication was consolidated with ELECTRICAL REVIEW AND WESTERN ELECTRICIAN six months later, Mr. Latta became an associate editor on the staff of this journal, having charge especially of the sections on electrical construction and inspection. In December, 1913, he was appointed special agent of the Underwriters' Laboratories, Inc., and about a year ago was advanced to the important position of general agent. While making his headquarters at Chicago, Mr. Latta had traveled very extensively in all parts of the country in the last four years, representing the Laboratories at a great many conventions, meetings and conferences and helping to spread the gospel of conservation by elimination of the fire hazard. It was a trip of this kind that brought him to Washington, where on January 12 he was taken down with pneumonia, to which he succumbed five days later. He was buried last Sunday at his old home, Durham, N. C. Mr. Latta was a good speaker and writer and for nearly seven years had done much to promote good construction and safe operating practice. He had all the admirable qualities of a true southerner and made friends wherever he went by his kindly geniality. His sudden death at the age of only 45, the prime of life, comes as a distinct shock to his former associates and other numerous friends.



James E. Latta.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

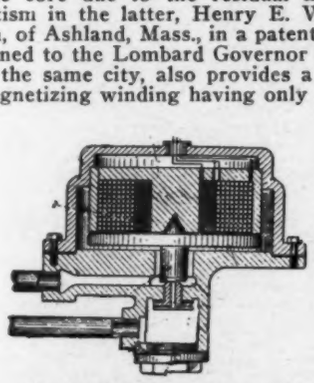
A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Bushing for Electric Wires (1,251,487).—Instead of threading a bushing, John J. Duck, of Toledo, Ohio, splits the flange on it into spring fingers and forms these so that they can be snapped into place, after the manner of glove-fastener.

Vapor Apparatus (1,251,628).—Instead of using a solid metal cathode in a vapor rectifier, Wilfred T. Birdsall, of Montclair, N. J., uses a cathode composed entirely of a jet of conducting vapor, such as mercury vapor, and uses a pool of mercury as the anode. The patent stands assigned to the Westinghouse Electric & Manufacturing Company.

Telephone Call Meter (1,251,644.)—A new call-metering system, devised by Henry P. Clausen, of Mount Vernon, N. Y., for the Western Electric Company. The meter is either a single counter, arranged for only counting calls in excess of those made at a predetermined rate per unit of time; or a combination of such a counter with another which records those made within a certain rate per time unit.

An Efficient Electromagnet (1,252,312).—To avoid a sticking of the movable core due to the residual magnetism in the latter, Henry E. Warren, of Ashland, Mass., in a patent assigned to the Lombard Governor Co., of the same city, also provides a demagnetizing winding having only sufficient ampere-turns to remove the remnant magnetism. Both this and the regular winding are designed for the same voltage, and contacts are provided for momentarily connecting either one or the other to the circuit.



No. 1,252,312.—Electromagnet.

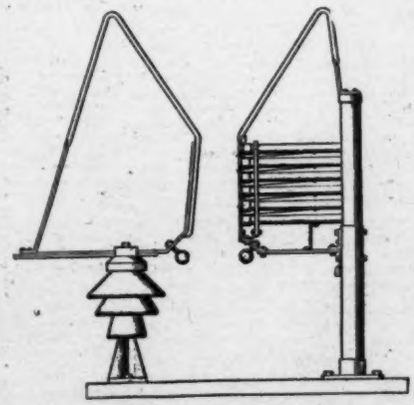
Loading Coil (1,251,651.)—Lloyd Espenschied, of Hollis, N. Y., in a patent assigned to the American Telephone & Telegraph Company, shows a loading coil with a ring-shaped core split into two parts separated by gaps. These gaps are filled with minute particles of magnetic materials separated by non-magnetic spaces, the aim being to render the core self-magnetizing.

Shield for Magnetic Coils (1,251,700).—Allied to the foregoing Espenschied patent, and assigned to the same company, is one to Thomas Shaw, of Hackensack, N. J. He bridges the gaps in the core by shields of magnetic material and preferably makes each shield of laminations extending parallel to the core.

Electric Riveting Tool (1,251,665).—Leo Hirsch, of Chillicothe, Mo., has assigned to Robert J. Chamberlain, of the same city, a half interest in an impact tool operated by a double-spool solenoid and having a novel arrangement of the contacts which make the connections for reciprocating the core.

No. 1,251,665.—Electric Riveting Tool.

Lightning-Arrester (1,251,754).—Two novel features are shown in the accompanying cut of a lightning-arrester patented by Nicholas J. Conrad, of Schweitzer & Conrad, Inc., Chicago. He breaks one of the horn-gap electrodes into a series of spaced pieces and connects these to one another through horizontal resistances. Then he also provides a pair of spherical electrodes arranged to have a lower breakdown resistance for certain types of disturbances, from which electrode the arc is transferred to the horn gaps above them.



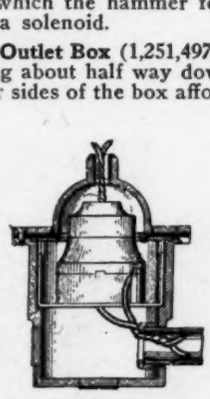
No. 1,251,754.—Lightning-Arrester.

Diaphragms of Carborundum (1,252,185).—The wide adaptability of carborundum and corundum is shown in a patent to Botho Schwerin, of Frankfort-on-the-Main, Germany, who molds the two ingredients in the form of porous and colloidal particles into diaphragms for electrolytic and electro-osmotic purposes.

Electric Arc Welding (1,251,764).—A welding system patented by Chas. F. Florandin and Alan M. Bennett, both of Westfield, N. J., the patent being assigned to the receiver for the C. & C. Electric Manufacturing Company. They provide two generators and connect them in series to afford a high striking voltage, after which the arcs are connected in multiple with one of the generators.

Beating Gold Electrically (1,252,076).—One of the few manufacturing processes which have hitherto baffled the substitution of mechanical power for manual labor is that of beating gold. Even this is now to be accomplished electrically, according to the patent recently issued to Morris M. Kupperstein, of Hartford, Conn., who has designed a special gold-beating tool in which the hammer forms the core of a solenoid.

Floor Outlet Box (1,251,497).—Slots extending about half way down along the inner sides of the box afford a seat for a yoke. This yoke carries the receptacle with its usual contacts and wire terminals. Patented by James M. G. Fullman, Pittsburgh, Pa.



No. 1,251,497.—Floor Outlet Box.

Separating Suspended Particles from Gases (1,252,183).—To reclaim particles suspended in gases, the gas is passed through tubes forming the collecting electrodes, while flexible filaments suspended in the tubes form the discharge or ionizing electrodes. Each of the filaments extends beyond the farther end of the tube in which it is hung, and is thickened near that end of the tube so as to reduce the surface field intensity at that point. The patent was assigned by Walter A. Schmidt and George C. Roberts to the International Precipitation Company, of Los Angeles, Cal.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

RUTLAND, VT. — Rutland Railway, Light & Power Company has announced that effective January 5, 1918, it will discontinue to furnish the first installation of carbon lamps free of charge. The company will renew any 16 or 32 candlepower carbon lamps returned unbroken, but will not furnish renewals for lamp stubs returned.

PALMER, MASS.—Wright Wire Company has awarded a contract to the Eastern Bridge & Structural Company, 88 Crescent street, Worcester, for the erection of a one-story addition at its local plant.

WEBSTER, MASS.—Webster & Southbridge Gas & Electric Company has commenced work on the construction of a large addition to its plant, to provide an increase in the present capacity of approximately 2,000 horsepower.

PROVIDENCE, R. I.—Providence Gas Company has awarded a contract to the H. Koppers Company, Maple street, Pittsburgh, Pa., for the construction of a large new coal gas plant at its works to cost about $1,500,000.

ALBANY, N. Y.—Three bills designed to provide for the construction of a large hydroelectric plant on Goat Island, Niagara Falls, by the State, were introduced in the Legislature by Senator L. W. H. Gibbs, of Buffalo. As proposed by the bill, the plant would be operated either under State management or by lease, and is estimated to cost about $3,000,000. Plans are to be prepared by the State engineer and surveyor.

BINGHAMTON, N. Y. — Binghamton Light, Heat & Power Company has commenced giving employment to women to read meters and deliver bills, due to the general shortage of labor. The company has offered for sale about 1200 shares of its 6 per cent preferred stock for the benefit of customers and employes, the stock to be sold at 85.

NEW YORK, N. Y.—Manhattan Fire Alarm Company, 44 East Twenty-third street, has filed notice of the dissolution of the company.

NEW YORK, N. Y.—The Interborough Rapid Transit Company, 165 Broadway, is having plans prepared for the construction of a one-story brick transformer station, about 50x100 feet, on Livonia avenue, near Rockaway avenue, Brooklyn. The structure is estimated to cost $40,000.

TOTTENVILLE, STATEN ISLAND, N. Y.—Due to a break in the submarine cable running from the foot of Amboy Road to the foot of Smith street, Perth Amboy, all telephone service in the lower part of Staten Island from Tottenville to Huguenot on one side of the island and Rossville on the other side was badly crippled. It is probable that the New York Telephone Company will lay a new cable to replace the one broken.

UTICA, N. Y.—The Utica Steam & Mohawk Valley Cotton Mills, 1000 Broad street, has awarded a contract for the construction of a one-story addition to its power house, about 31x73 feet, to cost $11,000. George Hopp, 1022 Seymour street, Utica, is the contractor.

BORDENTOWN, N. J.—City Council is planning for extensive improvements in its electric street-lighting system, and will also utilize Mazda lamps to replace the arc lights now in use. Lightless nights are now being observed in the municipality, but the work has commenced and is progressing favorably in order that it may be completed and ready for operation as soon as the coal situation improves.

BRIDGETON, N. J.—Bridgeton Gas Light Company has made application to the Board of Public Utility Commissioners for permission to increase its lighting rate from $1.00 to $1.25 per thousand feet, due to the increased cost of labor, coal, and general supplies.

BURLINGTON, N. J.—Fire, on January 14, destroyed a portion of the power plant and laundry building at the Masonic Home, just outside the city limits, with loss estimated at approximately $12,000.

DOVER, N. J.—An appropriation of $7,770 to be used for street-lighting purposes has been approved by the Board of Aldermen in the annual budget for 1918.

JERSEY CITY, N. J.—Ajax Electric Company has incorporated with a capital of $100,000, to manufacture electric generating machinery. The incorporators are H. Shippen, W. C. Banks and D. C. Roberts, all of Hoboken.

JERSEY CITY, N. J.—Pennsylvania Railroad Company is planning for the immediate installation of new electropneumatic push-button machines at Hackensack Meadows, between Jersey City and Newark, to comprise a 48-unit machine at "MV" cabin for the western receiving yard; a 36-unit machine at "CA" cabin, and a 12-unit machine at "MW" cabin. Direct current for the detector locking will be supplied by the Edison storage batteries, charged in series, discharging in multiple, duplicate motor generator sets being used for charging.

JERSEY CITY, N. J.—Public Service Electric Company has taken out a building permit for the construction of a one-story brick shop building to be located at the foot of Duffield street.

JERSEY CITY, N. J.—Hudson County Commissioners considering the issuance of bonds for $150,000 to provide for improvements and extensions in the county electric plant.

KEYPORT, N. J.—New York Telephone Company is planning for the installation of new underground conduit systems on a number of additional streets. Application for permission has been made to the City Council.

LAMBERTVILLE, N. J.—Due to the shortage of coal, the Lambertville Public Service Company has been compelled to suspend the operation of the electric street-lighting system.

NEWARK, N. J.—Terminal Electric & Auto Supply Company has filed notice of organization to operate at 605 Orange street. William Kirk, 82 Park avenue, East Orange, and Frank Palmietto, 886 South Orange avenue, Arlington, head the company.

NORTH ARLINGTON, N. J.—In its annual budget for 1918, requisition has been made for an appropriation of $2,737 to be used for street lighting for the borough. Approval has been granted by the Mayor and Council.

PATERSON, N. J.—County Fuel Administrator William H. Kearns has submitted a suggestion to the Public Service Corporation providing for the furnishing of power on three continuous days of the week, or for a half day daily, instead of on Tuesdays, Thursdays and Saturdays, as at present. It is held that industrial plants would be able to conserve coal in heating if this plan were employed.

TRENTON, N. J.—Public Service Corporation has completed all arrangements with the City, and is planning for the immediate installation of an electrolysis mitigation system.

AMBLER, PA.—As a movement to conserve fuel, the Town Council has ordered all street lights to be extinguished at 10 o'clock.

ASHLEY, PA.—Rapid progress is being made in the construction of the one-story addition to the local power house of the Central Railroad of New Jersey. The structure will be 70x70 feet, and cost $10,000. John W. Ferguson, Paterson, N. J., is the contractor.

BELLEFONTE, PA.—Due to the shortage of coal at the local plant, the Juniata Public Service Light, Heat & Power Company is shipping fuel from its plant at Millersburg, the latter plant being well supplied with coal reclaimed from the Wiconisco Creek during the past summer.

CLIFTON HEIGHTS, PA.—Kent Manufacturing Company is having plans prepared for the construction of a new one-story power house, about 40x67 feet, at its plant. The structure is estimated to cost $50,000. F. E. Hahn, 1112 Chestnut street, Philadelphia, is architect and engineer.

GREENCASTLE, PA. — The Greencastle Light, Heat & Fuel Company has filed with the Public Service Commission, a new tariff of rates for the supply of electricity, effective February 1, making the following increases: Minimum charge for lighting increased from 60 cents net to $1.00 net. Energy charges for power service up to 44-horsepower are increased one-half cent to one cent per kilowatt hour.

HARRISBURG, PA.—The proposed improvements at the plant of the Harrisburg Light & Power Company will include the installation of four new stokers, which it is anticipated will increase the capacity of the works by 2,000 horsepower. C. M. Kaltwasser is general manager.

HARRISBURG, PA.—City Council is planning for the immediate installation of a 5,000,000-gallon capacity electric pump at the municipal pumping station. It is expected that the work will be completed within the next few weeks.

KUTZTOWN, PA.—At a recent election, it was voted to issue bonds for $15,000 to provide for the completion of the construction of its electric plant, which will cost $38,000.

MIDDLEBURG, PA.—At a recent meeting of the stockholders of the Middleburg Creek Valley Telephone Company the following officers were elected: Harold McClure, president; James Magee, vice-president; George W. Wagenseller, secretary; John S. Kauffman, treasurer, and Frank A. Eyer, general manager.

NEW CASTLE, PA.—Connoquenessing Lawrence Light & Power Company has incorporated with a capital of $10,000 to operate a local plant. E. G. Dunlap is the principal incorporator.

NEW CASTLE, PA. — Mahoning & Shenango Railway & Light Company has been granted permission by the Public Service Commission to issue bonds for $2,000,000 to provide for improvements, betterments, etc.

PHILADELPHIA, PA. — Philadelphia Electric Company has notified the Public Service Commission that it would refuse service to patrons who failed to obey the orders of the fuel administrators as regards the lighting of display signs.

PITTSBURGH, PA.—Electric Appliance Company has incorporated with a capital of $25,000 and will manufacture electric appliances. A. A. Meagher is treasurer.

PITTSBURGH, PA.—Electrical Engineering Company has incorporated with a capital of $30,000. The company will engage in electrical engineering. Thomas G. Hodgdon is the principal incorporator.

ST. MARYS, PA.—Franco Battery Company has incorporated with a capital of $250,000, to engage in the manufacture of electric batteries. Lyle G. Hall is the principal incorporator.

WILMINGTON, DEL. — Whitewater Power & Mining Company has incorpor-

ated with a capital of $500,000, to engage in the distribution of electricity, steam, etc., and to engage in a general mining business.

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Company, Lexington Street Building, has awarded a contract for the construction of a three-story brick and concrete substation on Postoffice avenue. The Cowan Building Company, 106 West Madison street, Baltimore, is the contractor.

BALTIMORE, MD.—Richardson Auto Electric Corporation has incorporated with a capital of $50,000, to manufacture and repair batteries. The incorporators are Donald R. Richardson, Frank L. Pollard and Carl C. Schmidt.

WASHINGTON, D. C.—The United States Government, War Department, will build a three-story telephone building on F street, near Seventeenth street. Contract has been awarded to M. A. Weller Company, 816 Fourteenth street, Washington.

RICHMOND, VA.—Virginia Railway & Power Company is planning for improvements at its power house at the foot of Twelfth street. A new concrete addition, about 21x116 feet, will also be erected.

BEACH BOTTOM, W. VA.—Fire recently destroyed a portion of the substation of the Beach Bottom Coal Company, with loss estimated at $15,000.

CHARLESTON, W. VA.—Harris Popp Electric Company has incorporated with a capital of $10,000, to manufacture electric fixtures, etc. The incorporators are A. Nornoff, T. H. Popp and Thomas Popp.

MARLINTON, W. VA.—City is planning for the early reconstruction of its light and water plant recently destroyed by fire. Frank King is manager of the plant.

SWITCHBACK, W. VA.—Fire recently destroyed the central plant of the Appalachian Power Company. This station has been supplying power to 81 mines in the Pocahontas and New River fields. It is said the plant will be immediately rebuilt.

ESMERALDA, N. C.—Thomas F. Turner and J. T. Patrick will build a 50-horsepower plant for electric lighting, heating and power purposes. They contemplate installing water wheels, dynamos, motors, electric lighting outfit, etc. Address J. T. Patrick, Southern Pines, N. C.

RALEIGH, N. C.—North Carolina State College of Agriculture & Engineering is planning for the immediate installation of a new boiler in its heating plant to increase the capacity by 200 horsepower.

GREENVILLE, S. C. — Gower-Mason Electric Company has incorporated with a capital of $35,000, to engage in a general electric contracting business. R. S. Huntington and Dupont Guerry, Jr., are the incorporators.

HOLLY HILL, S. C.—Holly Hill Electric Service Company has incorporated by S. P. Wells, B. R. Bennett and R. G. Carson. The capital stock of the company is $10,000.

COLUMBUS, GA.—The Columbus Power Company has completed the erection of a three-story reinforced concrete addition to its plant, about 40x40 feet, and is now installing a new 7500 K. W. steam turbine, two 600 horsepower boilers, and auxiliary apparatus. John G. Bleecker is general manager.

SAVANNAH, GA.—City's budget for 1918 provides among other items the following: street lighting, $49,000; ornamental lighting, $3,000.

NORTH CENTRAL STATES.

CHADRON, OHIO.—The board of public affairs has considered the proposed specifications and plans for the new electric lighting plant. E. A. Safford, municipal engineer and Mr. Segue, a Cleveland engineer, have presented plans.

CLEVELAND, OHIO.—Improvements are contemplated to the municipal electric-light plant, involving an expenditure of $700,000. The work will include the installation of switchboard, generator, boilers and engines.

CLARKSVILLE, IND.—Clarksville Telephone Company has increased its capital stock from $1500 to $3000.

MARION, IND.—The Indiana Public Service Commission has authorized the Indiana General Service Company, controlled by the interests represented by R. E. Breed, of New York, to purchase the plants and business of the Marion Light & Heating Company, of Marion, Ind., and the Muncie Electric Light Company of Muncie, Ind. The purchase price consists of the exchange of securities and the refunding of bonds heretofore issued by the companies bought. The cities involved in the transfer had protested to the Commission that they feared their rights to bring the utilities under municipal control at some time in the future might be thrown into jeopardy by the transfer, and the order of the Commission, authorizing the purchase, specifically safeguarded these rights to the cities and towns involved.

DATES AHEAD.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

Vermont Electrical Association. Annual meeting February, 1918. Secretary-Treasurer, C. H. West, Rutland, Vt.

National Association of Electrical Inspectors. Annual convention, New York, March, 1918. Secretary-Treasurer, William L. Smith, Concord, Mass.

Wisconsin Electrical Association. Annual meeting, Pfister Hotel, Milwaukee, March 27-28, 1918. Secretary, George Allison, 1419 First National Bank Building, Milwaukee, Wis.

Tri-State Water & Light Association. Annual meeting, Charlotte, N. C., April, 1918. Secretary-Treasurer, W. F. Steiglitz, Columbia, S. C.

National Electrical Credit Association. Annual meeting, June 1, 1918. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June 15, 1918. Secretary, H. S. Ashley, Fort Worth, Tex.

Northwest Electric Light & Power Association; affiliated with N. E. L. A. Annual meeting September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

MARION, IND. — Rutenber Electric Company has increased its capital stock from $200,000 to $250,000.

SOUTH BEND, Ind. — Fire recently destroyed the building occupied by the Indiana & Michigan Electric Company, with loss of $120,000.

AURORA, ILL.—United Gas & Electric Company has filed an application with the State Public Utilities Commission for permission to issue general mortgage bonds in the sum of $100,000.

AURORA, ILL.—The Western United Gas & Electric Company has made application to issue $180,000 in bonds. Address Fred Bennett, secretary, 500 South Eastern avenue, Joliet.

CAIRO, ILL.—Electric Manufacturing Company has incorporated with a capital of $550,000, by Henry Tideman, Charles M. Roos and James H. Galligan.

CHICAGO, ILL.—Northwestern Electric Company, 408 South Hoyne avenue, has increased its capital from $100,000 to $200,000.

CHICAGO, ILL.—The capital stock of the Midland Electric Steel Company has been increased from $40,000 to $100,000.

HOMER, ILL.—Homer Electric Light & Power Company has incorporated with a capital of $30,000. The incorporators are J. M. Capel, U. S. Thompson and A. L. Vollborn.

MATTOON, ILL.—Central Illinois Public Service Company has filed a petition with the Illinois Public Utilities Commission for authority to execute a general mortgage on all of its property to secure the issue of six per cent general mortgage bonds in the amount of $500,000 and for permission to issue and sell $500,000 of general mortgage bonds.

GRAND RAPIDS, MICH.—Monarch Storage Battery Company has incorporated with a capital of $20,000. It will manufacture and deal in storage batteries. The incorporators are T. H. Lavier, H. B. Knowlson, H. G. Dykhouse and others.

MANITOWOC, WIS.—The city plant will furnish the Manitowoc Shipbuilding Company with 100 horsepower to be increased to 250 horsepower later. The 100 horsepower is to run new machinery being installed at the boiler works plant. The city decided to take the load and relieve the Wisconsin Public Service Company from stringing an emergency line down Franklin street.

MENAHGA, MINN.—Menahga Electric Company has incorporated with a capital of $10,000. The incorporators are S. J. Zeeman and others.

BELMOND, IOWA.—A transmission line for electric current is being constructed for a distance of four and one-half miles north and west of Belmond. Farmers are putting in motors for various purposes outside of the homes and in the homes, and in addition will light homes and other buildings electrically.

CEDAR RAPIDS, IOWA. — Electric Service Company has incorporated with a capital of $20,000, by C. E. Rowe and others.

GALESBURG, N. D.—Galesburg is installing electric lights and poles for the wires are now being erected.

SOUTH CENTRAL STATES.

JACKSON, KY.—Jackson Light & Ice Company is planning for the reconstruction of its power plant recently destroyed by fire.

CLINTON, TENN. — Clinton Power Company has incorporated with a capital of $20,000. The incorporators are R. A. Moser, J. W. Hill, H. D. Hicks, T. U. Cowley and C. J. Sawyer.

ALEXANDER CITY, ALA.—The council is considering ways and means to improve municipal lights.

ALEXANDER CITY, ALA.—City is planning for a bond issue of $10,000 to provide for the construction of an addition to the electric-light plant for increased capacity.

MOBILE, ALA.—Mobile & Ohio Railroad Company is planning for the reconstruction of its grain elevator and the installation of electrical machinery for its operation.

RUSSELLVILLE, ALA.—Surveyors for the Alabama Power Company have arrived and will make their headquarters here while engaged in surveying out a route through Franklin county and Russellville to extend the company's line to Sheffield and Mussel Shoals, the site of the Government nitrate and powder plants now under construction. Several attempts have been made by the Alabama Power Company to buy the light and water plant in Russellville in the last year and now that the company is extending its line through the city en route to Sheffield, where it expects to furnish practically the full amount of current used by the Government nitrate plants, in all probability the present light and water system of Russellville will be sold to the Alabama Power Company.

SOUTH FLORENCE, ALA.—In connection with the construction of No. 2 dam at Mussel Shoals on the Tennessee River, about 5 miles from Florence, the United States Government is planning the erection of a hydroelectric plant, the installation of water power and electrical machinery, and the construction of transmission lines. Estimated cost of the project is $13,500,000.

FORT SMITH, ARK.—Fort Smith Light & Traction Company has a 10-year municipal contract for white way on Garrison avenue. About 74 lamps of 400-candlepower each, with steel poles will be installed.

OSCEOLA, ARK.—Town officials are contemplating the installation of a 200-kilovolt ampere generating unit in the municipal electric plant during the coming summer. E. Teaford is manager.

TULSA, OKLA. — Southwestern Bell Telephone Company has had plans pre-

pared for the construction of a one-story addition to its telephone exchange plant at Fourth and Boston streets to cost $75,000.

SAN MARCOS, TEX.—San Marcos Telephone Company has acquired the telephone exchange at Staples and will construct telephone system from San Marcos to Staples, a distance of 18 miles.

SAN BENITO, TEX.—Commonwealth Electric Light & Water Company is planning to enlarge its power house and will install a new 100-horsepower engine and other equipment in its plant.

WESTERN STATES.

WOLF POINT, MONT.—J. E. Galehouse, of Carrington, and C. B. Aasness, of Bismarck, N. D., have bought the electric light plant here. Messrs. Aasness and Galehouse were partners in the light plant at Carrington for several years, selling it to the General Utilities Corporation. The transaction is said to have involved between $75,000 and $100,000.

CASPAR, WYO.—The power house of the Natrona County Electric Company is reported to have burned with a loss of $150,000.

DENVER, COLO.—Chemical Products Company, Louisiana and South Jason streets, was visited by fire January 14, of incendiary origin. The loss is estimated at between $50,000 and $75,000. The company has been producing Vanadium on sub-contracts for the British Government. The plant will be rebuilt immediately to discharge contracts.

SALT LAKE CITY, UTAH.—An addition of 11,270 horsepower will be made to the commercial electrical energy to be supplied to Salt Lake City and vicinity in the immediate future. This added electrical power is to be developed on the west and north forks of the Duchesne River, near Stockman, and is to be brought to Salt Lake City by means of high-tension copper transmission lines running west across the western part of Duchesne and all of Wasatch counties. From the north fork of the Duchesne River it is proposed to take 200 second cubic feet by means of a concrete dam and a 60-inch wood stave or metal pipe line 32,000 feet long to convey the water to a point where a head of 400 feet will be available. At this point there are to be two 60-inch Allis-Chalmers turbines to generate and transmit 9000 horsepower of energy to proportionate electric generators. From the north fork of the Duchesne River it is proposed to take 50 second cubic feet of water by means of a concrete dam, and through a 36-inch wood stave or metal pipe line 27,720 feet long, to convey the water to the power house mentioned, where it is to feed two 30-inch Allis-Chalmers turbines, which will generate 2270 horsepower for suitable electric generators.

ARLINGTON, WASH.—The plant of the Washington Coast Utilities Company has had its power plant near here put out of commission by recent floods. It is said that a new site must be selected.

CHEHALIS, WASH.—O. E. Anderson, of Portland and formerly of Chehalis, appeared before the city commission and presented a 30-year franchise for an electric light and power business in Chehalis to compete with the North Coast Power Company. The franchise passed its first reading and was referred to the city attorney. Its passage will depend upon a vote of the people.

Pe ELL, WASH.—It is reported that the North Coast Power Company, operating a net work of power lines in southwest Washington with headquarters in Chehalis is investigating the advisability of extending its line to this place from Meskill.

SEATTLE, WASH.—It has been decided to submit the question as to whether or not $350,000 in general bonds shall be issued to build the city car line on Railroad avenue and Spokane street to the voters on March 5.

SEATTLE, WASH.—Revised specifications for the development of the Diablo Canyon power project on Skagit River were presented to the Board of Public Works by J. D. Ross, superintendent of the city lighting department. The board unanimously approved the specifications and copy was forwarded at once to Corporation Counsel Hugh M. Caldwell, now in Washington, D. C., for the purpose of completing the filings of the city on the site. While the specifications were in general detail the same as those approved by the board on May 18 they were revised to meet new conditions as follows: "Instead of a lump sum bid for the plant and transmission lines, the specifications now call for separate bids. To put all bidders on the same basis, the specifications assume a standard price for steel. The interest on warrants has been raised from 5 to 6 per cent. The original ordinance has been amended and now authorizes an expenditure of $5,000,000 instead of $3,000,000 and confines the plant to federal domain. Transmission lines have been changed from steel tower construction to wood pole lines. The time of delivery has been made the essence of the contracts and the bidder is to state whether he prefers payment bonds or in cash."

ONTARIO, ONT., CAN.—Stockholders of the Ontario Power Company and the Ontario Transmission Company have approved the plan to expend approximately $1,800,000 on the construction of an addition to the plant of the power company.

PROPOSALS

CONDUIT AND LIGHTING.—Sealed bids will be received February 14 for conduit and lighting in the United States post office and court house at Elmira, N. Y. Specifications and drawings may be obtained from the Acting Supervising Architect, James A. Wetmore, Washington, D. C.

CABLE AND WIRE.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on the following: Plain interior-communication cable, for delivery at Brooklyn, N. Y., schedule 1665; 16,000 feet single-conductor lighting and power wire, and 13,000 feet, two-conductor lighting and power wire, for delivery at Puget Sound, Wash., schedule 1663; 15,000 feet single stranded rubber-covered wire, for delivery at Brooklyn, N. Y., schedule 1664.

ADDITION TO POWER HOUSE.—Bids will be received in the spring for addition to power house at the State Hospital for Insane, Independence, Iowa. One generator and two boilers will be added. The architect is H. T. Liebbe, State House, Des Moines, Iowa.

ELECTRICAL EQUIPMENT.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until February 2 for railroad track scale, pressure gages, marine clock, thermometers, steam traps, air compressor, tandem, link pins, cable clips, pipe fittings (black, galvanized and brass), steam cocks, stop cocks, valves, etc. Blanks and information pertaining to this circular (1195) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State street, New York, N. Y., Audubon building, New Orleans, La., and Fort Mason, San Francisco, Cal.

INCORPORATIONS

NEW YORK, N. Y.—Uneedus Mercantile Corporation. Capital, $30,000. To manufacture telephone and acoustic apparatus. Incorporators: H. J. Lucke, I. E. A. Konigsberg, and S. M. Baeder, 2 Rector street.

NEW YORK, N. Y.—Inventions Board, Inc. Capital, $5,000. To manufacture wireless apparatus. Incorporators: P. D. Strogoff, O. B. and M. Wiren, 5 Nassau street.

FARGO, OKLA.—Eight Mile Mutual Telephone Company has incorporated with a capital of $5000. The incorporators are A. M. Harvey and others.

GRAND RAPIDS, MICH.—Monarch Storage Battery Company. Capital, $20,000.

AUGUSTA, GA.—Whitney-McNeill Electric Company. Capital, $6000. The company will manufacture electrical fixtures. Incorporators: J. B. Whitney and Joseph B. McNeill.

YONKERS, N. Y.—A. & C. Manufacturing Company. Capital $9000. Incorporators: E. J. Abraham and C. R. Abraham.

CARLSBAD, N. M.—Carlsbad Light & Power Company. Capital, $150,000. Incorporators: Mary E. Tansell, of Olympia, Wash.; Herbert W. Tansell and Helen S. Tansell.

NEW PUBLICATIONS

REPORT OF PUBLIC SERVICE COMMISSION.—Public Service Commission, Second District, State of New York, recently sent out its Tenth Annual Report, for the year ended December 31, 1916. It consists of a bound volume of 300 pages.

MISSOURI COMMISSION LAW.—The Public Service Commission of Missouri, Jefferson, Mo., has issued as a 163-page volume the Public Service Commission Law of that state passed in 1913 and amended in 1917. Cross references and annotations make this copy very valuable to all interested in this subject. Of special interest will be found references to court and commission decisions clearing up points that may seem ambiguous or subject to misinterpretation. A complete general index and case-title index are also included in the volume, which was edited by W. H. Bohling.

THE CLEVELAND ELECTRIC RATE CASE.—F. W. Ballard, of F. W. Ballard & Company, engineers, Cleveland, Ohio, gives an historical review of the Cleveland Electric Rate Case, leading up to the findings of Public Utilities Commission of Ohio, as to the valuation of the plant and property of the Cleveland Electric Illuminating Company. The determination of this valuation is as far as the case has progressed before the Utilities Commission. This case seems to be outgrowth of competition by the Cleveland Municipal Light Plant, built by the city at a cost of $3,000,000, and which has been in operation 3½ years. The municipal rate for power and light was fixed at 3 cents per kilowatt-hour; and in May, 1914, the City Council ordered the Cleveland Electric Illuminating Company to lower its maximum rate to that figure. The latter company appealed to the Public Utilities Commission, and some of the main issues in the case are still before the Commission. The company spent $150,000 in having a complete valuation of its property made as per order of the Commission. Another valuation was made by the staff of engineers of the Commission; another was made by F. W. Ballard & Company. The questions involved in costs, deductions for depreciation and other features considered in arriving at a valuation are presented and discussed by Mr. Ballard in a pamphlet published.

SOUTH DAKOTA'S WATER POWER POSSIBILITIES.—The undeveloped water-power resources of South Dakota are briefly set forth in a pamphlet published by the Department of Immigration of that state. Sketches are given, showing favorable sites for dam construction and hydroelectric plants at a number of places on the Missouri River. The feasible sites mentioned are at Big Bend, between Chamberlain and Pierre; Little Bend, several miles above Pierre; Mulehead site, near the mouth of Sioux River; Chamberlain site, two miles above that city; Reynolds Creek site, 12 miles above Big Bend, and between Pierre and Chamberlain; Medicine Butte site, six miles above Pierre. The practicability of constructing water plants at the points named is supported by the opinions of good engineering authority. At Big Bend, and also at Little Bend, the river makes a detour of about 20 miles, leaving in each case a narrow neck of less than two miles, through which a tunnel may be driven, giving a net fall of 20 feet which could be utilized for developing power. The natural head might also be increased by dam construction. In accordance with legislative enactment in 1917, the citizens of South Dakota are to vote, in November, 1918, on a proposed amendment to state constitution, whereby the state will be authorized to develop, own and operate water-power plants, and authorize the state to issue bonds, with such proposed plants as security, for raising funds necessary to develop and construct power stations.

Financial News

Westinghouse Electric Paying Eight Per Cent.

Westinghouse Electric & Manufacturing Company in its new financing is paying 8 per cent for its money. This is pretty definitely established for the time being as price of new money for industrial and public service financing on any large scale. American Telephone & Telegraph Company has done the largest financing during the last three months. Its $40,000,000 notes went out with a snap because the company and its bankers did not quibble about a fraction of a point saving on a year loan. The company paid 8¼ per cent for its money, probably the highest price it ever paid. But the loan was a complete success and the banks getting 8¼ per cent through underwriting syndicate will be liberal purchasers of its securities when price of money is 5 per cent or less. The price to the public of new $15,000,000 one-year 6 per cent Westinghouse notes is 99 to yield a flat 7 per cent. Banks get an 8 per cent discount. It is understood the banking syndicate which purchased notes paid 98, making cost to company 8 per cent.

The next important financing was that of General Electric late in November. The company sold $10,000,000 6 per cent two-year notes. It is understood the money cost it between 7¼ per cent and 7½ per cent. Interest rate was a full ½ per cent lower than it would be today. This financing has been rendered necessary by the remarkable gross business the companies are handling and to some extent by special war work. In the case of telephone its security issue was made imperative by $25,000,000 special war construction and by February maturities of nearly $20,000,000.

Adirondack Electric Power Merger Near.

Deposits of stock are coming in rapidly for merger of the Adirondack Electric Power Corporation with the five upstate New York companies now owned by the General Electric Co. In connection with this merger, Robert W. Babson, one of the Adirondack directors, says: "Consolidation on the new basis should make a great saving in operating expenses, give all around better results in the development of the properties, and produce much better earnings for the Adirondack stockholders. It should give the Adirondack company a complete hold on the retail trade. At present about 35 per cent of its output is retail. Under the proposed plan about 75 per cent will be of this class. This greatly strengthens the position of the company, as a loss of one wholesale customer might be serious, while the loss of a few retail customers makes little difference in earnings. "Preferred stockholders have the opportunity of changing their 6 per cent stock to a 7 per cent cumulative preferred stock, or to a 5 per cent 10-year bond. Present common stockholders exchange for new common stock, on which it is estimated earnings should be at least twice as much per share as on the old common. Considering the great coal famine in all parts of the country, it is the patriotic duty of every holder to deposit his stock and bring this merger to a prompt and successful conclusion so that the vast amount of water power in that district may be utilized to its fullest extent."

Pacific Gas & Electric Company.

Following the action of the directors of the Pacific Gas & Electric Company in omitting the dividend on the company's common stock, F. G. Drum, president of the company, issued a statement on the company's financial affairs. The statement was dated January 3, and has just been received by mail. The statement in part follows: "During the past year our business has grown rapidly. Perhaps the best measure of this is the net addition of 26,699 customers to our lines in the eleven months to November 30, 1917, as compared with a net addition of 16,147 in the first eleven months of the preceding year. Every new customer represents the investment of a certain amount of new capital. The average new investment per customer had been steadily increasing since 1914, and is now greater than it ever has been, owing to higher labor costs, and the practical doubling of the cost of materials. Public utilities are under certain obligations to serve the public, and this fact partially limits the discretion which they might otherwise exercise in the expenditure of new capital. War conditions which, on the one hand, have stimulated our growth and increased the necessity for new capital expenditures have, on the other hand, made it practically impossible for corporations generally to secure new money except at prohibitive rates, and under these circumstances it seemed wise to your board to conserve the cash resources of the company, and to do everything possible to avoid entering the money market for new funds at this time. In the eleven months to November 29, 1917, compared with the same period of the preceding year, gross operating revenues increased $1,096,617; expenses increased $1,661,813, and net operating revenues decreased $565,195. The cost of substantially everything entering into the manufacture and distribution of the company's products has advanced tremendously. In the single item of oil alone advancing price added $1,171,252 to our operating expenses."

To Create Securities Board.

Creation of a federal "securities authorization board," which "shall be empowered to approve or disapprove the issuance of corporate, state and municipal securities for the period of the war," under constitutional limitations, was recommended in a report adopted by the board of governors of the Investment Bankers' Association of America at a meeting in New York recently. The report was presented by a special committee appointed at the association's last annual meeting to consider the question of "conservation of loanable capital in the United States for the period of the war." The next annual convention will be held in St. Louis, the date to be fixed by the board of governors.

Goodyear Tire Stock Increased.

Stockholders of the Goodyear Tire & Rubber Company at a special meeting approved the proposed increase of $50,000,000 in the authorized capital stock, the new stock to be in the form of $25,000,000 common and $25,000,000 8 per cent second preferred stock. It is understood that $15,000,000 will be offered to holders of the common stock for subscription at par. The proceeds will enable the company to capitalize to a large extent its floating debt.

Detroit Edison Bonds Oversold.

Spencer, Trask & Company announce that stockholders' subscriptions and advance applications were of such large volume as to heavily oversubscribe the $3,000,000 Detroit Edison Company ten year 7 per cent convertible debenture bonds, so that all advance subscriptions were drastically cut down.

Fall River Electric Notes.

A syndicate headed by Merrill, Oldham & Company, Lee, Higginson & Company, and Guaranty Trust Company, is offering $1,000,000 of two-year 7 per cent notes of Fall River Electric Light Company at 99¾, to yield about 7½ per cent.

Binghamton Company Offers Stock.

Binghamton Light, Heat & Power Company is offering for sale approximately 1,200 shares of its 6 per cent preferred stock to customers and employes. Arrangements have been made so that this stock can be sold at 85, netting the purchaser 7.06 per cent on the investment. It can be paid for in full or on an installment basis.

Copper Securities Active.

There seems to be a pertinent demand for the copper securities. Specialized advices suggest that the offerings in this group are comparatively small. Inspiration, Utah, and Anaconda are wanted. Information relative to copper metal prices does not indicate any change is near.

Copper Prices and Production.

The four-months' period for which the Government fixed the price of copper at 23½ cents expires with the closing week of January. There are said to be urgent requests from the smaller producers for an advance to 25 cents, and it is claimed the heavy producers are satisfied with the existing price. Perhaps the strongest argument in favor of no change from 23½ cents is that conditions have gradually adjusted themselves to that price.

While the producers' selling price and the Government's buying price remain steadily at 23½ cents per pound, for lake, electrolytic and casting copper, the jobber's quotation is 24.67½ cents, which represents a 5-per cent advance on the Government price. Under Government sanction certain jobbers, designated by the Copper Producers' Committee, are authorized to buy copper in carload lots for distribution among the smaller consumers; and in these transactions they are allowed a margin of 5 per cent above the established price of 23½ cents. Hence, the jobbers' quotation of 24.67½ for delivery in small lots. This arrangement, and the restrictions as to jobbers who have this distribution privilege, is found to be effective in preventing hoarding of copper for speculative purposes. The Copper Committee is charged with the duty of seeing that the privilege is not abused. During the last three months the copper mining, smelting and refining companies seem to have adjusted labor troubles by which their production was curtailed last summer, and are producing now at their normal capacities; and all current reports indicate that production of copper is about equal to the demand.

Since the above was written the Government has extended the period of 23½-cent copper to June 1.

Dividends.

There is talk that the Allis-Chalmers Manufacturing Company, having enjoyed a prosperous year in 1917, will soon consider liquidation of the 7¾ per cent arrears on the preferred stock. Payments that would put the common stock in line for dividends before the end of 1918 are considered likely.

American Water Works & Electric Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable February 26 to stock of record February 20.

Cities Service Company has declared regular monthly dividend of ½ of 1 per cent in cash on the preferred stock; and ½ of 1 per cent in cash and ¾ of 1 per cent in stock, on the common, all payable March 1 to stock of record February 15. December earnings will be delayed for several days because of delays in the mail from the west, due to storm conditions.

Columbus Railway, Power & Light Company has declared a quarterly dividend of 1¼ per cent on series B preferred stock, payable February 1, but determined that conditions do not warrant the declaration of a dividend on the common. The reasons for this action are principally excessive costs of fuel, supplies, metals, etc.

Fort Worth Power & Light Company declared regular quarterly dividend of 1¾ per cent, on the preferred stock, payable February 1 to stock of record January 21.

Illinois Northern Utilities Company has declared a quarterly dividend of 1½ per cent on preferred stock, payable February 1 to stock of record January 19.

Illuminating Power & Securities Company declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable February 15 to stock of record January 31.

Kellogg Switchboard Company declared the regular quarterly dividend of 2 per cent and an extra dividend of 2 per cent,

both payable January 31 to stock of record January 26.

Nevada-California Electric Corporation declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable January 30 to stock of record January 16.

Pacific Gas & Electric Company has declared a quarterly dividend of 1½ per cent on the first preferred and original preferred stocks, payable February 15 to stock of record January 31.

Pacific Power & Light Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable February 1 to stock of record January 22.

Railway & Light Securities Company has declared a dividend of 3 per cent semi-annually on the preferred and common stocks, payable February 1 to stock of record January 17.

The Connecticut Power Company declared the regular quarterly dividend of $1.50 on the preferred stock, payable March 1, 1918, to stock of record February 15, 1918.

Texas Power & Light Company declared regular quarterly dividend of 1¾ per cent on the preferred stock, payable February 1 to stock of record January 21.

Westinghouse Electric & Manufacturing Company has declared a quarterly dividend of 1¾ per cent, or 87½ cents per share, on common stock, payable January 31 to stock of record December 31, 1917.

West Penn Railways Company declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable March 15 to stock of record March 2.

Reports of Earnings.

AUTOMATIC ELECTRIC COMPANY.

Net profits of the Automatic Electric Company in 1917 were $264,189, after allowance for all charges, compared with $359,942 in 1916. The orders on hand Dec. 31 last amounted to $1,594,424. The company's balance sheet as of December 31 compares as follows:

Assets.

	1917.	1916.
Fixed assets	$4,647,647.13	$4,605,314
Securities owned	*896,977.66	1,019,002
Inventory	1,193,489.27	866,664
Cash	106,828.08	399,448
Accts. receivable & other assets	651,241.35	1,010,519
	$7,496,183.49	$7,901,047

Liabilities.

Capital stock outstanding	$5,074,520.00	$4,613,420
Cur. & def. liab't's	641,734.87	1,007,179
Adv. pay. on cont.	240,146.51	83,879
Surp. and reserves	1,539,782.11	2,196,788
	$7,496,183.49	$7,901,047

*Includes $50,000 liberty bonds.

DETROIT EDISON COMPANY.

Detroit Edison Company has issued the following comparative consolidated income account, for December and twelve months:

	1917.	1916.
December gross	$ 1,296,186	$ 1,112,433
Net	414,025	485,586
Surplus after charges	326,650	393,215
Twelve months' gross	12,279,925	10,066,786
Net	3,664,410	3,795,693
Surplus after charges	2,635,848	2,717,413

CONSUMERS POWER COMPANY. (Michigan.)

	1917.	1916.
November gross	$ 546,399	$ 456,322
Net after taxes	236,578	225,966
Surplus after charges.	145,175	160,156
Twelve months' gross	5,701,213	4,665,956
Net after taxes	2,455,471	2,509,413
Surplus after charges.	1,530,340	1,610,290
Balance after preferred dividends	967,832	1,153,165

PORTLAND RY., LT. & PR. COMPANY. (Portland, Ore.)

	1917.	1916.
November gross	$ 525,811	$ 479,367
Net after taxes	201,211	236,804
Surplus after charges.	23,699	54,689
Twelve months' gross.	5,942,084	5,453,455
Net after taxes	2,587,672	2,417,622
Surplus after charges.	431,573	239,624

WEST PENN. RAILWAYS. (Including subsidiaries).

	1917.	1916.
November gross	$ 672,613	$ 568,381
Net after taxes	235,941	252,188
Surplus after taxes	78,998	79,080
Eleven months' gross	6,984,869	5,705,741
Net after taxes	2,766,545	2,699,043
Surplus after charges.	986,173	823,250

LEWISTON, AUGUSTA & WATERVILLE ST. RWY. COMPANY.

(Subsidiary of Cumberland Co. Power & Light Company.)

	1917.	1916.
November gross	$ 71,307	$ 61,871
Net after taxes	13,986	14,411
Deficit after charges.	1,477	835
Twelve months' gross.	899,313	798,318
Net after taxes	226,542	254,844
Surplus after charges.	40,117	66,532
Balance after preferred dividends	4,117	30,532

THE COLUMBUS RAILWAY POWER & LIGHT COMPANY.

	1917.	1916.
November gross	$ 359,990	$ 316,468
Net after taxes	73,163	131,881
Surplus after charges.	27,244	89,019
Twelve months' gross	3,975,871	3,500,760
Net after taxes	1,122,402	1,431,622
Surplus after charges	569,784	917,625
Balance after preferred dividends	263,666	631,783

WEST PENNSYLVANIA POWER. (Including subsidiaries.)

	1917.	1916.
November gross	$ 365,238	$ 297,013
Net after taxes	110,313	129,828
Balance after charges and preferred dividends	46,853	78,762
Eleven months' gross.	3,576,572	2,706,802
Net after taxes	1,160,186	1,219,131
Balance after charges and preferred dividends	560,791	695,783

CUMBERLAND COUNTY POWER & LIGHT COMPANY.

	1917.	1916.
November gross	$ 243,036	$ 229,986
Net after taxes	72,638	75,455
Surplus after charges	2,795	6,397
Twelve months' gross	3,078,224	2,845,347
Net after taxes	1,641,601	1,094,304
Surplus after charges.	225,192	285,466
Balance after preferred dividend	87,192	147,466

MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA.

	1914.	1915.	1916.	1917.
Gross earnings	$756,572.75	$748,238.03	$862,501.55	$1,328,525.94
Deduct:				
Total expenses, including estimated taxes	634,958.25	564,176.34	624,568.94	576,038.30
Net earnings from operations	$121,614.50	$184,061.69	$237,932.61	$752,487.64
Income from investment of surplus funds	150,274.21	104,932.97	98,107.98	97,442.86
	$271,888.71	$288,994.66	$336,040.59	$849,930.50
Deduct:				
Reserves for depreciation	122,011.24	111,678.15	76,151.79	240,500.00
Net income for year after charging reserves	$149,877.47	$177,316.51	$259,888.80	$609,430.50

Capital Stock	$10,000,000.00
Undivided profits and reserves, December 31, 1917	2,150,000.00

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. Jan. 15.	Bid. Jan. 22.
Adirondack Electric Power of Glens Falls, common	..	10	15
Adirondack Electric Power of Glens Falls, preferred	6	65	70
American Gas & Electric of New York, common	10+extra	87	88
American Gas & Electric of New York, preferred	6	38	39
American Light & Traction of New York, common	..	221	205
American Light & Traction of New York, preferred	6	92	86
American Power & Light of New York, common	4	41	45
American Power & Light of New York, preferred	6	71	70
American Public Utilities of Grand Rapids, common	..	21	23
American Public Utilities of Grand Rapids, preferred	6	54	56
American Telephone & Telegraph of New York	..	103	103¼
American Water Works & Elec. of New York, common	..	4½	4¾
American Water Works & Elec. of New York, particip	7	8	9½
American Water Works & Elec. of New York, first preferred	..	59	60½
Appalachian Power of Bluefield, common	..	2¾	2¼
Appalachian Power of Bluefield, preferred	7	20½	20
Cities Service of New York, common	+extra	210	211
Cities Service of New York, preferred	6	74	72
Commonwealth Edison of Chicago	8	103	103
Comm. Power, Railway & Light of Jackson, common	4	31	31½
Comm. Power, Railway & Light of Jackson, preferred	6	63	64
Federal Light & Traction of New York, common	..	3	5
Federal Light & Traction of New York, preferred	..	25	22
Illinois Northern Utilities of Dixon	6	76	76
Middle West Utilities of Chicago, common	2+extra	20	25
Middle West Utilities of Chicago, preferred	6	57	60
Northern States Power of Chicago, common	ex.div.7	61	60
Northern States Power of Chicago, preferred	ex.div.7	85	87
Pacific Gas & Electric of San Francisco, common	5	30	33½
Pacific Gas & Electric of San Francisco, preferred	6	79	81
Public Service of Northern Illinois, Chicago, common	7	72¼	72¼
Public Service of Northern Illinois, Chicago, preferred	6	87	85
Republic Railway & Light of Youngstown, common	4	20¼	21½
Republic Railway & Light of Youngstown, preferred	6	52	54½
Standard Gas & Electric of Chicago, common	..	5½	5½
Standard Gas & Electric of Chicago, preferred	6	21	21½
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10½	10
United Light & Railways of Grand Rapids, common	4	26	27
United Light & Railways of Grand Rapids, preferred	6	61	61
Western Power of San Francisco, common	..	..	10
Western Power of San Francisco, preferred	6	40	42
Western Union Telegraph of New York	extra	89	90¾
Industrials—			
Electric Storage of Philadelphia, common	4	49	49
General Electric of Schenectady	8	129	130½
National Carbon of Cleveland, common	8	56⅛	56⅛
National Carbon of Cleveland, preferred	..	130⅜	130⅜
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	39½	40¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55

*Last sale.